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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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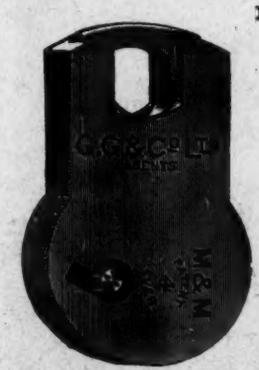

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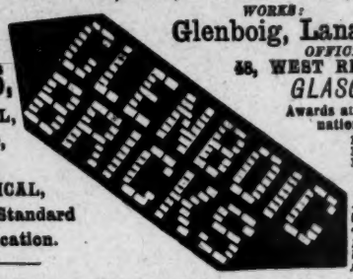

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CXL., No. 2840.] TUESDAY, OCTOBER 16, 1917. [69TH YEAR.

EDITORIAL NOTES.

Financial Hardships—A Real Move at Last.

THERE is gratification that at last a real move is being made in obtaining relief in the matter of the financial hardships from which the gas industry is suffering through war conditions and statutory peace-time control. From the first year of the war, we have fought hard for this against an opposition that has dwindled considerably as the inexorable circumstances have caused an increase in the weight of burdens, and a heavy decrease of the return on capital and of market values. What was foreseen in the latter part of 1914 has come to pass, but in measure greater than was at the time anticipated. However, for the part taken by us in this matter, full justification is to be found in the present position of the gas industry in regard both to capital and to trading finance, as well as in the conference which was held last Tuesday afternoon at Westminster, with the Chairman of the Executive Committee of the National Gas Council (Mr. D. Milne Watson) presiding. Our only regret is that such a great delay has taken place. Perhaps the Government Authorities concerned will take this as a commendable act of folly, and give the gas industry full credit for having so long struggled against long odds, and so dragged the capital of the industry into a morass of depreciation in earning power and value from which it will take some time to recover. But better late than never in trying not only to arrest, but to put an end to, the gloomy "landslip," which, however, can only be effected by those having the power. It was therefore an excellent piece of news that was heard in the Chairman's opening remarks at the conference, that there is fair expectation that the Ministry of Munitions will support the application for a modification of the sliding-scale and other things that are hampering the industry

In going before the President of the Board of Trade, the deputation (which will be composed of Members of Parliament and other gentlemen prominently identified with administration in the gas industry, with the Executive and a Special Committee of the National Gas Council) must be prepared with a scheme; and the one that was put forward at the conference, as embodied in a series of resolutions, possesses distinctly (if not, as Mr. Edwin Upton shows elsewhere, the ability to dispense uniform justice) the merits of simplicity and of automatic application. These are characteristics which have been held by us to be essential in any scheme of immediate relief, although we recently discussed the question from what was the then point of view of the Board of Trade that, the sliding-scale being in the nature of a bargain, every case would have to be individually considered. The Committee came to certain preliminary conclusions—such as individual consideration would impose an impossible task; also that it would be of no use asking for a suspension of the sliding-scale, seeing this would involve a very big principle. Further, that the scheme must be one that could be applied to every gas undertaking in similar case—that is to say, sliding-scale companies, maximum-price companies, and local authorities—and one that was likely to be accepted by the Government authorities, as it would only be waste of valuable time to submit a scheme that stood little chance of receiving adoption. Past general discussion has indicated the feeling on the part of some gas men that the adverse financial effects of the war ought not to affect the pre-war return upon capital. All along it has been felt by us that no parliamentary authority would listen to any suggestion that caused a complete eclipse of the sliding-scale and its operation, and empowered the payment of full pre-war dividends; and to stick out for the full pound of flesh, would only prolong the time of securing some measure of relief. The resolutions submitted to the conference, and accepted by those present, are quite moderate in their suggestion; and so they must be recognized by the Government authorities, if the position is placed before them with the transparency that it demands—from the destruction by the war of the fundamental factors upon which the sliding-scale is based and maximum prices have been allowed to the collapse of dividends and market values, and not overlooking the slender prices being paid for commodities required for national service.

The first point in the simple scheme is that the dividends of sliding-scale companies shall not fall more than 20 p.ct. of the amount by which they would be diminished if the existing regulations were adhered to. The illustration of the effect chosen by Mr. Milne Watson of only a 2d. increase was not sufficiently impressive or appropriate. It merely showed—with a 3s. standard price, a 4 p.ct. standard dividend, a 3s. variation of dividend for each 1d., and a 2s. 4d. pre-war price—a reduction of 6s. from the £5 4s. pre-war dividend, or 1s. 2d. with 20 p.ct. of the sliding-scale diminution of dividend taken off for each penny increase in price above pre-war charges. We prefer to take 1s. increase of the pre-war gas charge, making it 3s. 4d. Then we see that, under the conditions taken by Mr. Milne Watson, the sliding-scale dividend would be reduced from £5 4s. to £3 8s.—the difference being £1 16s. If the stockholder is allowed relief to the extent of 80 p.ct. of this £1 16s., he would then be receiving £4 16s. 10d., less income-tax, which in all conscience is a low dividend for a commercial enterprise in these times. But it would help to ease the present situation; and for this gas proprietors would be very thankful. It is also proposed that a company may pay the prescribed dividend instead of the dividend provided for by the scheme, whichever may be the greater. The object of this is to help those who have a low standard price, and therefore only a small margin between the pre-war selling price and the standard price. But there are some suffering from these conditions with low standard dividends; and the outlook is by no means a cheerful one for them. The scheme also proposes that maximum-price companies should be authorized to raise their prices by 6d. per 1000 c.ft. This will be satisfactory in the majority of cases, seeing that maximum prices have, as a rule, been fixed at a higher level than standard prices. A unanimous decision is that, in the case of local authorities with maximum prices, an increase of 6d. should likewise be authorized. There is divided opinion as to whether an application should be made for the temporary suspension of sinking funds. The view held by the Local Government Board is opposed, in the interests of sound finance, to any such suspension; and some of the larger corporations are of like opinion. It is therefore proposed that it should be left to each local authority who desire suspension to make out their own case. On the other hand, the Scottish undertakings have generally agreed upon what they desire in regard to this matter; and the National Gas Council will therefore support their views. However, reverting to the price scheme, it is contemplated that it shall operate for the period of the war and during the continuance thereafter of abnormal conditions.

There was practical unanimity at the conference. It was apparently felt (while alternative suggestions were made) that moderation was more likely to succeed than extravagant demand. The voice of the conscientious objector was heard. But it was feeble among the rest. The sliding-scale had an origin; it was based upon certain principles; it was a bargain with the public. To argue the question of the revision of the bargain, it is said, we must be in a position to sustain the argument. What better argument could

there be than that the fundamentals to the structure of the sliding-scale are now non-existent. There is no free trade in the gas industry to-day—the Government have claimed all the freedom in controlling prices, in prohibiting exports, and in granting licences; and the sliding-scale is showing its capacity for operating with flagrant degeneracy. The conscientious objectors have apparently little room in their consciences for the share and stock holder, though the circumstances of their part of the bargain have been knocked entirely out of existence. Conscientious objection can be totally blind to very essential aspects.

In conclusion, we should like to emphasize the acknowledgment made by Mr. Milne Watson of the work that Mr. Thomas Waddom and Mr. Ridley, of Newcastle-on-Tyne, have done in collecting valuable statistics regarding this question of financial hardship in its relation to the industry as a whole. They have been actively but unobtrusively working behind the scenes; and what they have done has been the incentive in the matter of what is being done now, and it will be highly useful in pursuing the case.

Railway Companies' Pressure on Gas Undertakings.

An article has been prepared, and will be published in an early issue, reviewing the Gas Acts for the session of 1917; and there is one thing that stands out from it somewhat conspicuously, and prompts the suggestion that a very strict eye should be maintained upon the Railway Companies, and that an effort should be made to keep their requirements within practical bounds, and not allow them to interfere with the general economical working of gas undertakings. They would kick-up row enough if gas undertakings—large customers as they are of the railways—were to combine for the purpose of interfering with their working. The companies are operating in collusion, with a view of moulding gas-supply conditions on the lines that they think desirable. We know what they have been doing up and down the country through their technical staffs (with occasional corroboration of their findings by an independent chemist), in the matter of testing town gas supplies for inert constituents. They have been jointly represented before the Board of Trade in respect of applications for calorific power standards; and largely, if not wholly, due to their persistent efforts came the condition as to a minimum pressure of 15-10ths, which (with a provision for quinquennial revision, if the Board of Trade think desirable, of the calorific power and pressure standards) has been adopted in the Acts of this session. With the 15-10ths minimum pressure, they should have been satisfied. But although this is the general minimum pressure in all the Acts dealing with the question, the London and South-Western Company in the Haslemere Act, the London and North-Western and Midland Companies in the Hemel Hempsted Act, and the London and North-Western Company in the Kenilworth Gas Act have secured special clauses giving them a preferential minimum pressure of 20-10ths at the inlet of the primary meter or meters registering the supply to the respective railway premises. This looks as though the companies are going to make a similar application in connection with Gas Bills whenever possible. This is unfair, as in all cases in the particular area where a station or other railway property is situated, it means maintaining a pressure at all times that will give a minimum of 20-10ths at the railway primary meter. In some cases, there will be no hardship in this; in others there might be. But a general minimum pressure of 15-10ths should have sufficed for the railway companies as for other people. It is also remarked that in the Haslemere Act there is a provision which enacts, in respect of the appointment of a gas examiner, that an application to two Justices by the London and South-Western Company shall be deemed to have been made, and to have like effect for all purposes, as though the application had been made by not less than five consumers of gas.

It is not only in Parliament, but in their direct business relations with gas undertakings that the railway companies are also exercising pressure, and doing their best to restrict liberty. Their latest move is to try to get gas undertakings to sign an agreement to send in their accounts for gas half-yearly only, while most gas suppliers have been in the habit of forwarding their accounts quarterly. The railway companies, on their part, send in their accounts monthly to gas undertakings, and insist on them being paid. What on their own part they consider to be a good business system should be a good business system for other people; but they prefer to be paid quickly themselves, and to obtain long credit from others. This is a very nice arrangement for them, but not for other people. There are gas administrators who feel very keenly that the railway companies are taking advantage of their position, and are acting in an oppressive way, which is anything but the way that expresses friendly relations. Among gas administrators and engineers who so feel is Mr. Thomas Berridge; and it is clear from what he tells us that he very strongly resents the action of the railway companies, and, in his opinion, gas undertakings ought not to submit to it. It seems, however, according to the statement of one large railway company, that they have consented to submit to it to rather a considerable extent. It is asserted by this company that there are no less than 170 gas concerns that have entered into the required agreement; and yet it is the railway companies who are making more bother than anyone else about the quality, pressure, and testing of gas. We are very sorry that so many gas undertakings have yielded to what appears to us to be (particularly in the circumstances) an unreasonable exercise of pressure, which pressure is accentuated by the fact—anyway in the case of the North Staffordshire Railway Company—that there is insistence, in connection with the carrying business done with them by a gas undertaking, upon the account being guaranteed by individual Directors, as though the Company's guarantee was not sufficient. Supposing all the large consumers of gas took the same high-handed proceeding, and insisted upon their indebtedness being discharged only at six-monthly intervals, we can see the item "loan from bankers" in gas companies' accounts being considerably augmented. Gas undertakings have their accounts for materials and goods to pay more frequently than at six-monthly intervals, they have their heavy weekly wages bills to meet, their weekly and monthly salaries list to satisfy, and their other financial obligations to discharge, just the same as other business people, including railway companies. But the railway companies must have payments for carriage every month; the gas undertakings must be satisfied with their accounts for gas being settled by the railway companies every six months. For a parallel, we should have to search far; but for a striking lesson in inequity, we need not go beyond it.

Retort-House Men for the Winter.

The attention of our readers is earnestly directed to the official statement appearing on p. 113, setting forth certain procedure to be adopted by managers of gas-works suffering from a shortage of retort-house labour. From this statement, it is to be inferred that the labour problem at gas-works is at last to receive attention—not a moment too soon; and, in hoping for the best, we are bound to remember that there is a very material distinction between considering a problem and solving it. That the position is acute can be vouched for, both from our own knowledge, and from the fact that it has not been the practice of Government Departments either before, or during the war, to act in anticipation of difficult and undesirable situations. However, even if late, it is all to the good that our unimaginative authorities now realize that, if vitally important bye-products of coal carbonization are to be forthcoming to the required extent, and if there is to be no interference with the output of munitions, it is essential additional labour should be provided for gas-works, and that without delay.

Regarding the procedure itself, while it may appear to many managers that, by stating their wants to their Local Employment Exchanges, they will only be taking steps which have already proved ineffective, we understand that, in actual fact, special machinery is being devised with a view to making the Exchanges themselves a more likely source of supply than in the past for the meeting of gas-works' requirements. Also, any further steps which may possibly be taken will be based on the figures collected from the Exchanges, showing the demands that have been made, and the extent—quite likely small—to which they have been met. Therefore, even those gas managers who have unfulfilled demands on Employment Exchanges should on no account fail to renew them after having carefully investigated their accuracy. In fact, the demands which will be made *during the next week or ten days* will be considered to be the total requirements of the industry at the present time as regards retort-house labour. Let us make this quite clear. Though the total requirements of gas-works may not be directly met through the Employment Exchanges themselves, immediate

application will enable the compilation of lists to be made without delay. In this connection it should be mentioned that no application must be for a single man more than a gas-works is ready to employ at once. Any demand which is made, and which is not substantiated when a suitable man is offered, can only result in any future application from the same quarter being ignored. The last but one paragraph of the official statement (which should also be promptly complied with) indicates the source from which any deficiency that may arise in regard to skilled retort-house men will be remedied. The form on which applications are to be made for the release of individuals from the Colours will have to be obtained from the Ministry of Munitions Release from Colours Section, at the address given at the foot of the notice; and the form itself will be found to contain information as to where it is to be sent. The main point, however, which we have to emphasize here is the immediate observance by responsible gas officials of the directions that are contained in the statement.

Two Shillings and Sixpence Addition to the Price of Coal.

As foreshadowed at the recent conference that representatives of the gas industry had with Mr. Guy Calthrop, and in the recent wages agreement with the miners, the price of coal at the pit's mouth for home consumption and for shipment (except to France and Italy) has been increased by 2s. 6d. per ton, in consideration of the recent advance of war wages to miners. For shipment and house coal the increase came into operation yesterday; but for home-consumed coal (other than house variety) the increase has retrospective application, dating from Sept. 17. The gas industry has reason for a strong protest in this connection. The price of gas has to be fixed in advance, and cannot be altered without notice to the consumers. But now, in the case of those concerns that have not secured a reduction of price through the price revision order—which abrogated as from Sept. 10 contracts so far as prices were concerned for the purpose of bringing them into accord with the Price of Coal (Limitation) Act—they have clapped on to them the whole of the 2s. 6d. per ton as from Sept. 17, for which they had not calculated, and which means an immediate extra working charge of something like 2½d. per 1000 c.ft. Business cannot be properly conducted under such erratic conditions as these. It is true that, before the order as to price revision as from Sept. 10, not a few gas undertakings were paying more than the 4s. standard excess on the prices paid under contracts entered into during 1913-14; and every gas concern will now have to look very narrowly into the question to see that they are not paying a penny more than they are legally obliged to, and more especially as the 2s. 6d. is probably not the end of the increased cost of coal burden. Some collieries revised their prices as from Sept. 10; now they will be again revising them as from Sept. 17; and it is possible they will find occasion to further revise them.

Such an uncertain position is extremely unsatisfactory, especially to those whose trading is on prices made in advance. The notice of the 2s. 6d. per ton increase states: "In making this addition to the price of coal, increased costs "of production other than the war wage have *not* been taken "into account." Then why has 2s. 6d. increase been granted per ton of coal? We recently saw a computation made by a mining expert that the annual cost of the latest advance to miners means £21,375,000; and the recent Home Office Report on Mines and Quarries for 1916 showed that the total coal output last year was 256,348,351 tons. Calculating on these figures, it is seen that the advance to miners is equal to 1s. 8d. per ton of output. If, therefore, the 2s. 6d. does not include something more than the miners' advance, for what purpose has the extra 9d. to 10d. been granted? Yet the passage already quoted suggests the possibility of another addition; and we get this further stimulant to doubt: "Applications made by certain districts for an increase in "the standard amount under the Price of Coal (Limitation) "Act are at present being examined by the Controller of "Mines." Apparently the Controller does not look upon the 2s. 6d. as an addition to the standard price. Buyers will do so. The 4s. addition was given by the Act to cover the extra costs occasioned by the war; the 2s. 6d. comes into the same category—seeing that the recent advance to the miners was to be regarded as a "special war wage." There must be a very careful re-examination of the position to see whether the 6s. 6d. per ton (9s. in the case of Wales) does not amply cover all the increased costs. The position is very nebulous and unsatisfactory.

It will be remembered that, in the agreement with the miners, a clause appeared to the effect that the increase was given on the understanding that any increase in the selling price of coal should not operate to secure a further advance of wages under the wages agreements in various districts, unless the increased selling price warrants an advance beyond the special advance just granted. The miners will not be long in finding that the generosity of the Coal Controller does, in their opinion, warrant an advance beyond the special one lately made. In fact, a statement has been in circulation (which it is suspected emanated from some quarter in which the miners are interested) to the effect that the recent advance does not necessitate any increase in the price of coal—that it is already well provided for in the prices the collieries are receiving. Coming events, despite agreements, sometimes cast their shadows before them.

A "Total Heat" Recording Calorimeter.

There is nothing new in recording gas calorimeters; but there is in a "total heat" recording calorimeter. And to Mr. John F. Simmance, so far as we are aware, falls the credit of having first devised such an instrument. And not only so; it is an instrument of manifold capabilities. While it will register the total heat of gas automatically and continuously on a chart, an independent calorific test can be made by actual measurements of the gas burned, the water heated by the combustion of the gas, and the amount of heat imparted to the water. In other words, it is a standard calorimeter with an auxiliary device for recording the total heat units on a chart; and at any moment the chart reading can, without interrupting the record, be checked by, or compared with, an experiment or test made upon the standard calorimeter. Another point is that the record can be made either in B.Th.U. per cubic foot or in calories per cubic metre, which is a further novel feature of this invention. By its construction and operation, the instrument automatically ensures a constancy or balance of volumes, temperatures, and humidity; and it will therefore, under all conditions, Mr. Simmance assures us, indicate the correct heat value of the gas without any error due to the causes which affect calorimetric results. From this brief indication of merits, it will be seen that we have here an instrument which should be of inestimable value to the gas industry in these days when Parliament has settled our controversies over net and gross values, and has given to the gas industry the right to the total or maximum heat value of their primary commodity. With the introduction of new processes affecting the composition of gas as produced, it will be very necessary, when peace returns, to exercise care to comply with the standard of quality approved by the Legislature; and there are no better means of maintaining complete supervision over the calorific power than by a reliable recording instrument. When the instrument registers the total heat value, so much the better; and still further so when by the same instrument special check tests can be made. It is quite true that calorific value does not mean everything; it is equally true that gas composition means a great deal in the final result to the consumer. But, under the circumstances of coal and carbonizing variations, it is impossible on economic grounds to fix a standard of composition. There may in time be some statutory limitation of the inert constituents. We are not anxious to see this; but if it comes about, it will be the fault of those who have transgressed in this respect. A standard of gas quality of some sort is dear to the heart of Parliament; they would regard it as unthinkable not to have a standard. The only available one is calorific value; and to be allowed to take credit for the maximum heating power is something worth having. Hence the interest that the gas industry will have in this instrument. We have not had any practical experience of it; but it may be taken that an instrument to which the name of Simmance is attached is one the accuracy of which is well vouched for. A full description of the apparatus is given in another part of this issue.

Sketch of the Scheme of Fuel Research.

Gas men will read with more than ordinary interest the report signed by Sir George Beilby, F.R.S., the Director of the Board of Fuel Research, which delineates the lines of the research which the Board are about to undertake, and describes the Research Station

which is to be put down at the East Greenwich works of the South Metropolitan Gas Company. We cannot this week fully accentuate by editorial reference the points of the report, as it only came to hand shortly before this issue was sent to press. However, the report is reproduced *in extenso* in other columns; and gas men will see that, apart from the general interest attaching to what may be the starting-point of the deliverance of the nation from the crude methods of utilizing our coal resources, the scheme of research in every part shows that they are closely concerned in the inquiry and the developments that will arise from the fundamental work upon which the Board will be entering as early as they are properly equipped for the purpose. Those electrical enthusiasts with ideals embodying coal carbonization as a primary and integral part of electrical generation will observe, probably with an amount of resentment, that the Board are not by any means prepared to accept plausible and uninvestigated notions of the kind without inquiry, and without consideration of the economic position of other existing industries. From this it will be at once gathered that the Board are treating the question from a national point of view, and not from that of any single industry; and their views will have to be taken into account with those of the Board of Trade Electric Power Supply Committee. The decision to put down the research station at the East Greewich works of the South Metropolitan Gas Company is one which will commend itself to all coal carbonizers, in view of the facilities and resources which can there be offered to the Board. It is just what would be expected of the Chairman of the Company (Mr. Charles Carpenter, D.Sc.) and his colleagues, in a matter of such critical and far-reaching importance to British industries and the country at large, that they should have generously met the Board in this matter. The Research Station is going to be very complete in its design and equipment, and capable of development as required. This is necessary, for from the initial work will open-up many roads for further research. To ponder over the possibilities merely leads one into the infinite.

Coal Redistribution Scheme.

Members of the Midland Association of Gas Engineers and Managers met last Thursday—under the presidency of Mr. Geo. Stevenson, of Long Eaton—and discussed a number of questions affecting gas-works operations arising out of war conditions. The principal subject was that of coal supplies in connection with the redistribution scheme. Experiences differ as to what is happening; and views regarding the future are widely separated—some men are optimistic, and some are the reverse, and the reverse are apparently in the majority. In nearly all cases, the members have not been allocated their requirements under the redistribution scheme—some have not got 50 p.ct.; while others are somewhat better, and others are somewhat worse off. There is a heavy spoiling of stocks proceeding—stocks laid in for the depth of winter, and to help the Coal Controller to save ton-mileage when traffic difficulties are most severe, through weather conditions and the demands upon a much reduced railway carrying capacity. But already the coal redistribution scheme is causing a disappearance of these stocks, and is doing precisely what the Coal Controller does not want—projecting greater pressure upon transit in the winter owing to the disorganization of supplies hardly before winter has set in. As Mr. James Paterson says, before the transport reorganization scheme came on to the scene, there was coal enough. But to-day deliveries are short, which shows that distribution is at fault. It is right the Coal Controller should be kept accurately apprised of the coal position of an industry so important to the prosecution of the war and to the country generally.

Efforts to Improve Matters.

But it must not be thought that the Coal Controller is not doing anything to straighten out matters. Nor must it be forgotten that it is only little more than five weeks since the redistribution scheme came into operation; and it could not be expected that such a vast change in the movement of coal supplies could be effected without a hitch, and without time for adjustments. So far, however, those who were getting in good supplies before, but are not doing so now, fail to see how the country is going to benefit unless there is complete transformation in the situation. The coal factors and coal merchants are crying out for the complete withdrawal of the scheme. But the Coal Controller, fortunately for himself and his position, is a stoic of no mean order. Only the other day he received a deputation from the gas industry, arguing with him as to the unfairness of the factors' 9d. per ton in the case of gas undertakings, while the railway companies are only paying 3d. per ton. He courteously informed the deputation that 9d. was the maximum, and left the members to infer that, if they could succeed in getting the factors below the 9d., he would have no objection, and, to the extent of the reduction, so much the better would it be for the successful gas undertakings. Later on—last Tuesday to be precise—he received a Sub-Committee of the Coal Factors' and Wholesale Merchants' Association, who wanted to inform him as to what he already knew regarding the conditions existing under the reorganization scheme. The Controller admitted that in certain cases, particularly in Area No. 13, there is undoubtedly grave dislocation. His department, he stated, are working energetically to put matters upon a proper basis as quickly as possible. He could not, however, hold out any hope of the abandonment of the transport scheme, as, in his opinion, considerable economies in haulage are being effected. He has every hope that, when the adjustments upon which his staff are working are completed, they will bring about a great improvement in the situation. We hope this will be the case. Anyway, the Ministry of Munitions have impressed upon the Coal Controller the necessity for keeping the gas industry well supplied, in order to produce the materials for high explosives and as large a quantity as possible of liquid fuel. The Midland Association are going to collect statistics as to stocks, deliveries, and requirements from their members (they hope other District Associations will do the same) with the view of placing them before the Controller. They are also pressing upon the attention of the National Gas Council the retrogressive course of supplies since the redistribution scheme came into force.

Gas for Motor Vehicles.

A very proper subject for District Gas Associations to consider so as to secure working uniformity and conveniences is the supply of gas for motor vehicles; and this, as the reports of their meetings show, is realized by the members. There is good encouragement that this, especially in the case of commercial motors, is going to supply a permanent line of business in view of the low cost compared with petrol, given an acceptable means of storing the gas on the vehicle itself. The flexible storage holders of the present are only temporary expedients. Part of the encouragement to vigorously prosecute the business, and to get it established as soon as possible on a permanent basis, is found in the campaign in favour of coal gas, in which Mr. E. S. Shrapnell-Smith, Economy Officer to the Petroleum Executive, is taking a prominent share. He has been away up North addressing the Manchester, Liverpool, and Counties Commercial Motor Users' Association; and he then stated that the extending use of ordinary town gas, which might be said on the average to cost less than one-third as much per mile run as petrol for corresponding work, promises to be of the greatest national importance. He added that it was hoped that many thousand commercial motors would be equipped to run on town gas within the next few months. This is satisfactory—not only in relation to present business, but because, at the end of the war, motor spirit is not likely to slip down to pre-war prices with the additional demand for it; and users will find a strong persuasive force in cost, as well as in the fact that every town in the country will, it is hoped, be in the position at any hour of the day to recharge storage receptacles by the mere turning of a tap at the gas-works or garage fitted-up with the necessary means.

After-War Supply of Raw Materials.

As of considerable importance to the gas industry, if adequate use is made of the opportunity, must be regarded the appointment, by Dr. Addison, Minister of Reconstruction, after consultation with the other Government Departments concerned, of a Committee to consider and report upon questions connected with the supplies of raw materials which will be required by British industries for the purposes of restoring and developing trade after the termination of the war, and the best means of securing and distributing such supplies. The Committee (which will be known as the Committee on Supplies of Materials) will be desirous of consulting the trades concerned as to the steps requisite to safeguard the needs of industry and to secure convenient and equitable distribution. In this Committee and the Board of Fuel

Research, there ought to be found channels for securing a confirmation of the decision of the Joint (Residuals) Committee of the two Houses of Parliament, that the gas industry should have freedom in developing its own secondary products to the advantage of itself and the community at large, and thus permanently end the unwise attempt of the Private Bill Authorities to construct a barrier to the economic development of the industry. In what they are doing, the Private Bill Authorities have been swayed by chemical manufacturers in the House rather than by national interests. The chemical manufacturers have freedom; and to impose restriction upon the gas industry is a line of conduct that has not been, and in fact cannot be, defended. One member of the Committee on Supplies of Materials is Sir Henry Birchenough, K.C.M.G., a Director of the Imperial Continental Gas Association and of the Continental Union Gas Company, which concerns are not stifled in their development by such regulation as the Private Bill Authorities here impose in opposition to the judgment of the Joint Committee. If the principle of free trading in the secondary products of gas manufacture is unsound, and not in the economic interests of the country, then the Private Bill Authorities ought not to have allowed the one-third purchase regulation. But, fortunately for the gas industry, the principle is not unsound; and the industry has right on its side.

PERSONAL.

Mr. Walter T. Maskrey, who has been the Manager of the Ambergate and Bull Bridge Gas-Works for the last seven years, has been appointed Gas Manager at Matlock Bath, in succession to Mr. W. Frost, who obtains an appointment at Durham.

Sub-Lieutenant W. J. Liberty, R.N.V.R. (Public Lighting Inspector of the City of London), who is at a Naval Base somewhere North, has, on the recommendation of the Admiral Commanding there, been promoted Lieutenant R.N.V.R. by the Admiralty.

At a special meeting of the Institution of Civil Engineers last Thursday, Mr. Henry E. Jones was, on the proposition of the Council, elected President. The vacancy arose through the retirement of Mr. W. Barton-Worthing, who had been appointed to the chair.

It is gratifying to learn that Mr. A. F. Browne's third son, Mr. H. M. Browne, of the South Metropolitan Gas Company's Distribution Staff, who was recently a Captain in the 2/6th London Regiment, has now been appointed second-in-command, with the rank of Major.

On resigning from the position of Manager of the Scunthorpe Gas-Works, which he had held for seventeen years, Mr. J. W. Turner has been presented by the members and officials of the Urban District Council with a gold hunter watch. The employees at the gas and water works have given him a gold watch-chain.

Prior to his leaving Tunbridge Wells to take up the position of Assistant Engineer at the Doncaster Gas-Works, Mr. D. T. Livesey was presented by Mr. L. J. Langford, the Engineer, on behalf of the staffs and employees of the Tunbridge Wells Gas Company, with a handsome solid leather suit-case, which was accompanied by the good wishes of all for success in his new appointment.

Southern District Association of Gas Engineers and Managers.—The autumn general meeting of the Association has been fixed for Thursday, Nov. 8, at 2.30 p.m., in the meeting room of the Royal Society of Arts, John Street, Adelphi, W.C. Mr. John West will present a paper on the "Most Economical Method of Carbonizing Coal for Supplying Light, Heat, and Power by the Gas Industry and the Maximum Supply of Munitions of War;" and Messrs. Doig Gibb, H. O. Carr, G. M. Gill, and T. S. Lacey have promised to take part in the discussion. Tea will be served on the termination of the business of the meeting.

Gas in a Sunderland War Hospital.—Mr. Norman S. Cox, of Sunderland, has forwarded to the British Commercial Gas Association a series of photographs showing gas apparatus which his Company have fitted up in the Sunderland War Hospital; and the photographs appear in the October number of the Association's "Bulletin." The appliances fitted in the main kitchen include two ranges 6 ft. 6 in. long, 2 ft. 6 in. deep, and 3 ft. 3 in. high; two roasting ovens 4 ft. 4 in. high, 2 ft. 3 in. wide, and 2 ft. 8½ in. deep. There are a combined hot-plate and carving-table 8 ft. long, 2 ft. 6 in. high, and 2 ft. 9 in. deep; two vegetable steamers, fitted with wire baskets, and constant cold water supply cistern 6 ft. high, 2 ft. 8 in. wide, and 2 ft. 6 in. deep; two thirty-gallon vegetable boilers with wire baskets; one thirty-gallon water-boiler; two ten-gallon milk sterilizers; and a two-gallon quick-service gas-kettle for tea-making.

RETORT-HOUSE LABOUR FOR THE COMING WINTER.

Urgent Attention Required.

We are asked by the Ministry of Munitions to state that all gas managers who are in need of additional retort-house labour should immediately notify their requirements to their Local Employment Exchanges, even if they have already done so within the last few months.

Demands so made should not exceed the number of men who are needed for immediate engagement, as a supplementary demand can always be made at a later date should occasion arise. These demands should be kept up to date at the Local Employment Exchange.

The authorities appreciate that it is possible that gas-works requirements will not be adequately met by means of labour that may be obtained through Employment Exchanges; but if this procedure is followed, complete information will become available as to the full extent of the demand for additional men.

If the men required are not forthcoming, it may be necessary to endeavour to obtain the release of a number of *ex*-retort-house men now serving with the Colours; and therefore every gas-works' manager should take steps immediately to equip himself with a complete list of retort-house men who are now with the Forces. These lists should include the man's name and initials, regimental number, unit, and station, and (if they are known) age and medical category.

In cases of real urgency, where the above particulars have been ascertained, applications for the release of individuals may be made on "Form A.R.M.W. 34," which can be obtained from the Ministry of Munitions, Release from Colours Section, No. 6, Whitehall Gardens, London, W. 1.

A CONFERENCE ON LEAVING CERTIFICATES AND LABOUR AT THE MINISTRY OF MUNITIONS.

Representatives from the National Gas Council and various electricity (including electric tramway) undertakings throughout the country have recently had several meetings with representatives of the Ministry of Munitions regarding the serious position which will follow the proposed abolition of leaving certificates. It was pointed out to the Ministry that the staffs of gas and electricity undertakings have been very heavily depleted owing to the war; and that, if any action were taken which would still further reduce labour, the results would be very grave. Various suggestions were made to the Ministry with a view to help the gas industry in its present difficulties; and the Ministry promised to do all in its power to render assistance.

ELECTRICITY SUPPLY MEMORANDA.

Every human being has his knowledge limitations. Among the rest, the writer of "Gossip" in "Electrical Industries" has his. He frankly confesses as much in a column article that he has circulated on "Gas Co-Operation and the Super-Station." There are many things that are beyond his knowledge and his imagination in gas and electricity work. He has come across the Presidential Address of Mr. J. Mogford to the Welsh Institution of Gas Engineers and Managers [see Sept. 25, p. 557]; and in what Mr. Mogford had to say about the future developments of the gas industry, unfair competition, and co-operation, the writer of "Gossip" seems to see the gas industry struggling for a new lease of life with the grasp of the electrical industry tightening about it. When the daily enlarging work of the gas industry is examined by a commonsense discriminating person, there is complete failure to detect any evidence of the need to struggle for a new lease of life. However, the critic takes the suggestion of Mr. Mogford, that the interests of the gas industry should be protected by the formation of District Committees for discussing the subject of interconnection on the lines adopted by the electrical industry; and he complains that Mr. Mogford did not develop the argument, or indicate in any way whether the linking-up of gas plants would lead to the higher economies and efficiencies promised in the case of electricity. He ventures the opinion, too, that it is rather dangerous to assume a close parallel between gas and electricity in the economic and engineering aspects of gas and electricity. We are not aware that anyone in the gas industry has assumed any close parallel between the two. And we fail to find, while the critic accuses Mr. Mogford of an omission, that he himself in any way develops an argument showing that the linking-up of gas plants does not lead to higher economies and efficiencies. It is patent to all men equipped with brains and technical knowledge that the higher economies and efficiencies that are a need of the electrical industry are not in several respects of the same character as those Mr. Mogford had in mind. For example,

A Want of Penetration and Imagination.

the electricity supply industry suffers from the fact that its process is thermally terribly inefficient; it suffers, too, from the want of storage to balance the load on the producing plant; it suffers also in its attempt to develop a domestic heating load from the heavy price of its B.Th.U., which is not in any way compensated for by the actual efficiency of its appliances; it suffers likewise from the fact that its whole system teems with seats of breakdown, and that its reputation for unreliability is notorious. Now what are the aims of interlinking electricity undertakings? To gain some economy and a better efficiency by reducing the weight of part of these drawbacks. Interlinking in their case merely seeks palliation. On the other hand, it cannot be said that the process of the gas industry is thermally or (over-all) productively inefficient; the gas industry possesses the economy and protection of storage; it cannot be said that in normal times (even now relatively to electricity) that its B.Th.U. are not cheap; it cannot be truthfully asserted that its supply is unreliable; it cannot, owing to the large variety of its products, be said that its services to the community do not cover a considerably larger area than the town electric supply. Interlinking in the case of the gas industry has for its dual aim the economy derivable from concentration within a given area, and the lower price at which to the extreme limits of that area the community can be served. The critic probably does not know that over many years there has been proceeding a considerable amount of absorption of the smaller gas undertakings by the larger, with gains in the purchase of materials, manufacture, and so forth; and, through high-pressure distribution and governing at the other end, rural districts can now be served at prices closely approximating to those in the large centre from which the supply is given. In this explanation, perhaps he will see how interconnection between large and small gas undertakings does bring about economy and efficiency.

Economies to Come and Business Growth.

There is another matter. The critic has not yet come across any reasoned scheme for the co-operation of gas and electricity in connection with superstations. Co-operation depends somewhat upon what he means by "superstations;" and there is not divulged any capacity on the part of the critic for presenting a sound reasoned argument either for or against co-operation. All he can fashion in his mind is the ancient hope of the electrical engineer that, with the cheapening of electricity, he will take over more and more of the business now handled by gas undertakings—not only in lighting power, but in domestic and industrial heating, in cooking, and in other directions. Let us see. Those who aspire to "superstations," to the amalgamation with them of coal-carbonizing and chemical works, to trading in all the products, and to taking upon themselves the provision of the necessary condensing water and the unknown costs of distribution—heavier it would appear than those of conveying coal to local concerns for treatment—have for long to face the obstacles of existing capital and the heavier costs of money, labour, and materials. They have to face, too, all the fluctuations of the products markets; they will have to further face the heavy competition from other coal-carbonizing industries and from the new synthetic processes of producing fertilizers and other commodities that are going to affect the future. These grandiose schemes of the electricians are being talked of at a time when the cost circumstances are combined against that rapid achievement of economy which the electricians now so devoutly desire. It may be that they will not be allowed to continue the burning of bituminous coal for steam-raising only. It may be that cleverer brains than those possessed by the critic may find that the greater economy will be in co-operation with an industry already strongly established as coal carbonizers, and producers of gaseous and solid fuel and materials of great chemical value, and an industry with markets already in existence for gas, coke, and other products. In the work of marketing all these things, the local producer will always stand in a better position than the producer at a distance. If he does not do so, then the fault will be his. We see no reason why producing economies should not attend the gas industry. We have found such economies in more ways than one during the war. We see no reason why the efficiencies of the whole range of gas consuming appliances should not continue to improve. We see no reason why the tremendous lead that we have now in the cheapness of our B.Th.U. should not be maintained—giving in 6 c.ft. of gas as many B.Th.U. as the electrical unit affords. We see every reason why the gas business in all directions should continue to grow; and so does every electrician who has the power of penetration and is not cursed with a superficiality of a no mean order. "The gas undertakings," says the "Gossip" writer, "want to co-operate in order to secure a new lease of life." This is an error. Not all gas undertakings desire to co-operate. Those that do, see in co-operation, not a new lease of, but a larger, life. Coke-oven gas is being piped to the Middlesbrough gasholders; gas is being supplied in Middlesbrough, even in war times, at 2s. per 1000 c.ft. Does our friend think that, whatever economies are to be secured in the future, the electricity industry is going to bag the lot? There was an article recently in "Electrical Industries" on "The Lack of Perspective."

A "Remarkable Discovery."

"Meteor," of the "Electrical Times" and his readers are much exercised over a reported statement by Lord Haldane on Sept. 28, at a meeting held under the auspices of the Workers' Educational Association of Edinburgh. His Lordship has been Chairman of the Reconstruction Sub-Committee connected with electrical energy; and the Committee, he says, have made some very "remarkable discoveries"—which have been embodied in a report. Upon the Sub-Committee were "distinguished" electrical engineers and "great" men of business; and they have reported that, if the 80 million tons of coal that are used in the industries of the country at the present day were employed in the "best form" for getting the maximum output of energy from it, the whole of the work could be done for 25 million tons. In the "best form!" It is clear that on the Committee a few distinguished gas engineers were required with their experience of coal carbonization, and the obtaining of energy and chemical products. However, there need be no alarm. The Board of Trade Electric Power Supply Committee and the Board of Fuel Research have yet to have their say. But "Meteor" and others are wondering what are the "remarkable discoveries." One appears to be the ancient proposition that large power stations should be erected at the pit-head, and the energy transmitted any distance up to 200 miles "at a cost of one-third the present cost." There are a number of distinguished electrical engineers who would be very alarmed over the future of the electricity supply industry if they thought it was going to be committed, without much further consideration, to pit-head generation. There are some strong doubts existing as to whether the cost of transmission would not cancel the saving that the innocent Lord Haldane has so readily imbibed.

Defects of Electric Fittings.

It is now 35 years since the first General Act was passed applying to electricity supply; but even to-day electricians have to bemoan the defects of the electrical apparatus offered to the public. It is one of the banes of their lives that users of electricity should have so much of which to complain in the matter of the collapse of their appliances. A writer in the "Times Engineering Supplement" calls attention, as many others have done before him, to these weaknesses, which he ascribes to insufficient attention in manufacture. This may be partially so; but it is not the whole reason of breakdowns. But, whatever the cause, the frequent breakdowns are bad for the reputation of the electricity industry, and are not commercially advantageous. "The failure of a local contact, the fracture of a flexible cord, or the breaking of a small spring may be just as serious from the user's point of view as the breakdown of the whole supply;" and he urges that no pains should be spared to minimize the trouble. That such advice should be deemed necessary at this time of day in electricity supply does not say much for the ingenuity and care of the manufacturing part, nor for the industry as a whole. He cites the ordinary "standard" bayonet-cap lampholders, and says that, while "most" holders are so made that the lamp-cap pins enter the bayonet slot at right angles to the plungers, when pushed home they occupy a position that precludes the possibility of establishing adequate contact with them. The writer has quite a lot to say about this and kindred matters. He finds, too, that wall plugs and sockets are accessories that "in several respects" need overhauling. Tumbler switches, too, of the flat type now in common use have defects that ought never to have escaped notice; and they could easily be rectified. Criticism of the cheaper grades of fuse boards supplied for house wiring, he also alleges, is long overdue. There are "few" really satisfactory ironclad switches or switch fuses for domestic and other light duty; and manufacturers would do well to concentrate upon improved designs. Ironclad fuses of poor design and worse construction are "commonly" met with. Makers of connectors for portable heating and cooking apparatus have their own ideas as to what is suitable for coupling-up the flexible cord to the appliance. No two connectors are interchangeable, though they may differ in size but slightly. The list of defects could be extended. Manufacturers are urged to seize an opportunity such as is not likely to occur again for taking stock of things, and getting out designs for electrical accessories of sound construction and reasonable cost, which can be placed on the market to supersede existing patterns as soon as manufacturing conditions will permit. But, perhaps, manufacturers do not think that things are quite so bad as portrayed. It will serve the competitors of electricity well if they do not. It is interesting to note that the allegations as to defects are penned by one who thinks that Germany in the future will probably be a less formidable competitor than the United States. Allies though they be, it will not please the British electrical manufacturers to know that the American makers have already secured a firm hold of the electrical market in this country, and are prepared to lay down plant to manufacture repetition goods at very low rates. The grip of the American manufacturers may hereafter be found as tenacious as that of the German ones in the pre-war days.

Power Supply Committee.

It is understood that the Board of Trade Electric Power Supply Committee have not proceeded so far with their work as it was anticipated they would have done by this time. Away back in the summer, there was talk of the taking of evidence being completed by the end of September; but then we thought this would be smart work for a Departmental Committee, with such a large subject to handle. Even now there are local authorities owning electricity works who are hoping that there may be some revision of the composition of the Committee, which shows that, from the municipal point of view, there is still a want of confidence that their interests will be properly dealt

with. It is stated that several local governing authorities have lately adopted a resolution which emanated from Darlington, and which proposes that a communication be immediately addressed to the President of the Board of Trade, the Parliamentary Secretary to the Board, and the member of Parliament of the borough concerned, expressing the strong opinion that the representation of local authorities owning electricity undertakings is totally inadequate, and that the Government be requested to give local authorities at least equal representation on the Committee as is granted to commercial corporations and private companies owning electrical undertakings. The further opinion is expressed that local authorities should be permitted to nominate their own representatives. We are afraid at this late hour further modification of the constitution of the Committee will not be entertained. It would mean the investigation beginning *de novo;* and we should imagine the Board of Trade are just about sick of the dissatisfaction that has streamed into them over this matter. At the same time, the views of some of the strong men of the Committee are well known; hence the uncomfortable feeling that all may not be well with the independent development of the municipal concerns.

FURTHER WAR-TIME SUBSTITUTES FOR COAL IN GAS-MAKING.

SAWDUST, ROOTS, AND FLOUR IN CONTINENTAL WORKS.

The pages of our French contemporary the "Journal des Usines à Gaz" continue to testify to the straits from shortage of coal to which many smaller gas-works are reduced, not in France only but in certain parts of Switzerland. Some of the undertakings which have thus turned to other materials as a partial substitute for coal are those serving small areas of population of the order of 10,000 people; but even in larger Swiss towns, such as Geneva and Neuchatel, recourse has been had to sawdust in part replacement of coal. While the data communicated in regard to these materials have fortunately not direct importance for gas makers in this country, there are no doubt many places outside Europe where advantage can be taken of them.

At Geneva, in using wood in Bueb vertical retorts, one or other of two methods is followed. According to the first, sawdust is added to the normal charge of coal in the retorts; the sawdust being conveyed from bunkers and mixed with the coal to the extent of 10 p.ct. According to the alternative method, solid logs of wood, about 3 ft. in length, are carbonized in this condition, not in chips or small fragments as at Berne [see "Journal," *ante* p. 66]. A normal charge of wood is 120 kilos (260 lbs.), as against 563 kilos (1240 lbs.) of coal. After three hours the charge in a retort has sunk down sufficiently for a second charge to be inserted without decharging the previous lot. The retort is not emptied until the second charge has been carbonized—viz., at the end of six hours. The wood charcoal is quenched with a hose; but it is intended to put down extinguishing chambers. Wood is at present being used on two benches, each containing eight retorts, working with a mixed charge—that is to say, nine of one bench with wood and nine of the other bench with coal. Every five or six days this arrangement is changed over, with the result that the tars produced are not acid. The furnaces, when worked in this way, consume about 25 p.ct. more fuel than normally; while the yield of gas is 240 to 250 cb.m. (8570 to 8830 c.ft.) per tonne. The gas produced by the carbonization of the wood is not separated from that from coal.

At another Swiss works, that of La Chaux-de-Fonds, in the Canton of Neuchatel, and with a population of 36,000, sawdust is being carbonized in horizontal retorts served by Fiddes-Aldridge machines. The average charge is 170 kilos of sawdust (375 lbs.) and 30 kilos (66 lbs.) of coal, as against the previous all-coal charge of 450 kilos (990 lbs.). The period of carbonization in retorts 14 ft. 8 in. long is six hours. At the altitude (3280 ft.) of the works, the calorific power is 3800 calories, corresponding with 4200 calories at 0° C. and sea level. The large proportion of water in the tars (about 30 p.ct.) has given a good deal of trouble, owing to the extreme difficulty of separating it.

At the Neuchatel works, which normally carbonize 7500 tonnes of coal per annum, wood is being used to the extent of 28 p.ct. of the coal, yielding a gas averaging 4300 calories. In horizontal retorts of 9 ft. 6 in. length, a charge of from 70 to 95 kilos (150 to 210 lbs.) is distilled in four hours, as against 170 kilos (375 lbs.) of coal in six hours. Wood is used in various forms—logs, sawdust, bark, and even small branches and chips; the yield of gas averaging about 300 cb. m. (10,600 c.ft.) per tonne of wood. Owing to the considerable evolution of steam, an eye has to be kept on excessive pressure during the first period of carbonization. Also the use of wood in the retorts very speedily leads to the removal of the carbon deposit and to a porous condition of the refractory. As a measure of prevention, it is necessary to alternate the use of wood and coal—the latter renewing the carbon deposit. Corrosion of retort heads and ascension pipes has been experienced from the acid products of the wood, and the large proportion of carbonic acid in the gas has involved the use of lime purification with all its troubles. The wood charcoal is quenched, part of it with water and part in extinguishing chambers; the latter commanding a higher price. The experience at Neuchatel has been that in the distillation of wood the temperature should not exceed 1100° C.

To turn from Switzerland to France, the little coast town of Arcachon in the Gironde, of 8000 population, has made trial of heath roots as a substitute for coal. So far, close on 7½ tons of this material have been used. The loss in weight between its delivery and carbonizing amounts to nearly 5 p.ct. The material is simply reduced to manageable size in a timber yard and, despite the considerable handling, retains up to the time when it enters the retorts a certain quantity of earth and sand. The total production of gas has been 1906 cb.m. (67,300 c.ft.), together with 183 kilos (400 lbs.) of charcoal. On the basis of the gross weight as delivered to the works, the yield of gas is thus 23·78 p.ct., and of charcoal 22·84 p.ct. With 60 to 75 kilos (130 to 165 lbs.) in a retort, the period of carbonization is about 2½ hours; the yield of gas per furnace during a full working day being considerably below that when using either coal or wood. The charcoal is discharged on to the floor of the retort-house and shovelled into extinguishing chambers; but as these are not luted until all the retorts are discharged, there is a certain loss by combustion. Most of the charcoal is about the coarseness of No. 0 coke; about 25 p.ct. of it resembling breeze. It is, on the other hand, much heavier than that from pinewood, rating about 30 kilos per hectolitre (25 lbs. per bushel) including dust, or 22·5 kilos per hectolitre (18·5 lbs. per bushel) without dust. It burns much less rapidly than pine charcoal, and can be said to stand towards this latter as metallurgical coke does to ordinary gas coke. It commands a sale at prices from 25 to 30 p.ct. more than that of pine charcoal. As regards the quality of the gas, without tests having been made of the lighting or calorific power, it appears to be satisfactory. At any rate, delivered to consumers in about equal admixture with that from coal, it has not aroused comment.

Lastly, at the works of the fishing town of Royan (Charente Inférieure), with a population of 8000, use has been made for the manufacture of gas of a cargo of spoilt flour recovered from a torpedoed vessel. The distillation of 1400 kilos (1 ton 7 cwt.) yielded 320 cb.m. (11,300 c.ft.), together with 720 kilos (1600 lbs.) of coke. The flour proved to be a good coking material, yielding a coke of fine quality and with scarcely any ash. As evidencing the search among smaller French gas-works for any material which can be carbonized, there is the significant recommendation that gas makers should keep in touch with undertakings using flour, with a view to obtaining from them consignments which are useless for the making of bread.

A Committee on Gas Traction.—It is stated that, in order to co-ordinate and standardize the procedure to be adopted in the extended use of coal gas as a substitute for petrol in the driving of motors, Mr. Walter Long is about to form a Committee on Gas Traction.

Manchester District Institution of Gas Engineers.—At the quarterly meeting of the Institution in the Grand Hotel, Manchester, on Saturday, the 27th inst., a paper will be read by Mr. J. E. Blundell, of Macclesfield, on "Some Experiments on 'Steaming' in Continuously Operated Vertical Retorts." The question of coal gas for motor vehicles is also down for discussion.

Midland Junior Gas Association.—Several papers have been promised for the forthcoming session of the Association—the authors including Mr. E. W. Smith (Chief Chemist to the Birmingham Gas Department), Mr. E. Cooke (Accountant), and Mr. V. E. Green (Assistant Engineer in the Industrial Research Laboratories). There will also, of course, be the Inaugural Address of the new President (Mr. R. G. Marsh); and one or two items yet remain to be fixed up. The opening meeting will take place on Thursday of this week, at 6.15, in the Reading Room at the Council House, Birmingham, when Mr. Marsh will deliver his address.

Construction and Heating of Retort-Settings.—A series of questions relative to the construction and heating of retort-settings have been drawn up by the Council of the Manchester and District Junior Gas Association, in connection with a scheme of practical collective investigation suggested by Mr. S. Tagg at the annual meeting earlier this year. These questions are being sent out to the members; and it is hoped that useful comparative data will result. After the information has been collected, it will be summarized for publication; but the source will not be disclosed. The Council suggest that the investigation should be completed not later than March 1 next, and then forwarded to the Hon. Secretary (Mr. James Bridge, of Stretford).

Scottish Junior Gas Association (Eastern District).—The opening meeting of the fourteenth session of the Association will be held in the Heriot Watt College, Edinburgh, on Saturday afternoon, the 20th inst. The annual lecture will be delivered by Mr. W. R. Herring; the subject being "Some Notes Contrasting Gas Practice during the Past Twenty Years." Mr. W. Darling, Gas Office, Aberdour, has been appointed Hon. Secretary and Treasurer, in place of Mr. R. Scott. Other meetings and visits arranged for the session are: Nov. 17, visit to the Cowdenbeath Gas-Works, and discussion thereon. Dec. 15, visit to the Edinburgh Meter-Testing Station. Feb. 9, 1918, visit to the Forfar Gas-Works, and a paper. March 16, joint visit with the Western District Association to the Alloa Gas-Works. April 20, annual general meeting in Edinburgh.

FINANCIAL HARDSHIPS OF GAS UNDERTAKINGS.

A Conference in London.

There was a large and representative conference, last Tuesday afternoon, at the Central Hall, Westminster, to consider the pressing question of the financial hardships which have devolved upon gas undertakings through circumstances connected with the war. The meeting was held under the auspices of the National Gas Council of Great Britain and Ireland; and among those present both companies and corporations were represented. Mr. D. Milne Watson occupied the chair.

The Chairman, in opening the proceedings [which extended over somewhere near two hours], remarked that he was very glad to see such a large meeting, as it indicated the great amount of interest that was taken in this most important question. The meeting had been called for the purpose of receiving a report of the Sub-Committee who had been sitting to consider the financial hardships which had befallen gas undertakings since the war. This Committee consisted of the Executive Committee of the National Gas Council, together with other representatives. The names of the other representatives were:

J. H. Troughton, Newmarket; C. G. Grimwood, Sudbury (Eastern Counties Gas Managers' Association, Eastern District).
R. G. Shadbolt, Grantham; J. Barton, Peterborough (Eastern Counties Gas Managers' Association (Western District).
E. Upton, Liverpool; S. Meunier, Stockport (Manchester District Institution, Lancashire Section).
C. Wood, Bradford; J. H. Brearley, Longwood (Manchester District Institution, Yorkshire Section).
J. Ferguson Bell, Derby; James R. Duff, Banbury (Midland Association of Gas Engineers and Managers).
Jas. Ballantyne, Hamilton; L. Hislop, Uddingston (North British Association, Western District).
A. C. Young, Arbroath; Alex. Yuill, Dundee (North British Association, North Eastern District).
T. Waddom, Newcastle; T. H. Duxbury, South Shields (North of England Gas Managers' Association).
T. P. Ridley to be invited, Newcastle.
J. R. H. Jacobs, Southampton; C Valon Bennett, Rochester (Southern District Association of Gas Engineers and Managers).
J. E. Kenshole, Merthyr Tydfil; Octavius Thomas, Pentre Rhondda (Wales and Monmouthshire District Institution of Gas Engineers and Managers).

At this point, the Chairman took the opportunity of acknowledging the services that had been rendered by Mr. Waddom and Mr. Ridley, of Newcastle-on-Tyne, who, he said, had worked extremely hard, and got together most of the valuable statistics with regard to the industry as a whole, which had been most useful, and would continue to be so in pursuing the case further. He was sorry that Mr. Waddom was indisposed, and unable to be present. As to the object with which they had gathered together, there was no need to emphasize the hardships under which they as an industry laboured. Those present were probably as conversant with them as he himself was. At any rate, he felt sure he was speaking to a convinced audience. They were suffering from higher prices in all directions. Coal, oil, shipping, and labour had all gone up by leaps and bounds. There were also restrictions with regard to tar, benzol, and sulphate, all of which, if not under control, would fetch far higher prices. But this was not the worst; because, unlike other industries, when they put up the price of *heir* commodity (gas), they had the misfortune to be subject to a penalty. In other cases, a man increased the price of the commodity he sold in order to maintain his dividend; but gas undertakings under the sliding-scale had to reduce theirs. This, however, was not all. The Government had asked the public to use as much gas as possible, and had circularized the whole country, with the result that almost every undertaking had been inundated with business, and many showed increases of as much as 20 p.ct. in consumption. The hardship was that, the more the Government urged the use of gas in the national interest, the more money the undertakings would lose, because many would be driven to make oil gas as the only solution, at a substantial loss per 1000 c.ft. All this seemed a very poor return for their patriotism. It was an exceedingly hard case, and one which was altogether different from others in the commercial world. The ordinary average trader, whenever he was faced with high prices of raw materials, and could not obtain them, reduced his output, so that he could carry on the business at a profit; but the gas industry, owing to Government action, and to the necessity of supplying benzol, toluol, and other munitions of war, were driven to furnish more and more gas, to their own loss and undoing. Certain resolutions were being brought forward from the Special Committee; and he hoped the conference would agree that they were moderate.

A Deputation to the Board of Trade.

In the course of his opening statement, the Chairman announced that the President of the Board of Trade had agreed to receive a deputation from the Council next week; and he hoped that the Ministry of Munitions would support their case.

The Resolutions.

Turning then to the resolutions to which he had referred, the Chairman read them out, and explained their exact purport. The effect of the first resolution, dealing with the sliding-scale, would be that the dividend would only fall 20 p.ct. of the amount by which it would be diminished if the existing regulations were adhered to. As an instance, take a pre-war price of 2s. 4d., with a standard of 3s., and £4 as the standard dividend. With the price at 2s. 4d., the dividend would be £5 4s., taking the sliding-scale as 3s. for every penny. As things now stood, suppose a company had to increase the price of gas from 2s. 4d. to 2s. 6d., the dividend would be £4 18s. under the present sliding-scale, instead of £5 4s. as at 2s. 4d. This was a difference of 6s. If, however, only 20 p.ct. of the decrease in dividends were taken for each penny increase above the pre-war price, the dividend at 2s. 6d. would be £5 2s. 10d., instead of £5 4s., as at 2s. 4d., or a difference of 1s. 2d. This would show that the industry did not intend to claim absolutely the whole "pound of flesh." It would do away with the idea that they were not prepared to suffer at all, and would prove they were ready to sacrifice something under the special circumstances of the case. At the same time, it would enable them to recover a great deal of their lost ground. In the first place, the resolution was framed so as to continue to operate during the continuance of the war and for a period of twelve months thereafter; but it had since been suggested that it might be desirable, instead of inserting "for twelve months," to make it read "so long as abnormal conditions obtained." This would, he thought, be preferable, because twelve months could not by any manner of means see the end of the abnormal conditions. The second proposal was that, alternatively, a company might pay the prescribed standard dividend, instead of the dividend herein provided for, whichever might be the greater.

The second resolution of the Committee was to the effect that a company entitled to pay a maximum dividend should be authorized to raise their maximum price by 6d. without being under any obligation to decrease the dividend payable in respect of the same half year.

Then the third resolution set forth that in the case of municipal gas undertakings application should be made to the proper authorities for an increase of 6d. in the maximum price, where there was one. The representatives of municipal undertakings had met by themselves to consider the matter; and this was the decision unanimously arrived at by them. They had further discussed the question of their own financial difficulties, and reported that certain municipalities felt that some additional relief ought to be afforded. Various suggestions had been made; but the Sub-Committee agreed it would be better for each undertaking to make out its own case. This had reference to the sinking funds, as to which there was no chance of agreement. The Scottish gas undertakings were unanimous that action should be taken in this direction. The National Gas Council would support their views before the proper Government department.

The Operation of the Sliding-Scale.

The meeting was then thrown open for discussion, and Mr. Edwin Upton (Liverpool) referred to the fact that those companies who went to Parliament at a later period got a very small margin or no margin at all, and quoted his own Company as a case in point. Liverpool went to Parliament in 1914, and their selling price was given as the standard price, with a neutral zone of 3d. They were then selling at 2s. 1d., and the price is now 2s. 4d., so that they are up to their standard. He urged that the undertakings at the bottom of the scale suffer the greatest hardship; and to meet such cases as this, the Committee had suggested the alternative of paying the standard dividend.

The first resolution having been formally moved and seconded, Mr. R. W. Edwards (Aldershot) argued that, though they all sympathized with sufferers, one must not get away from the origin of the sliding-scale.

Mr. C. F. Botley (Hastings) pointed out that a number of companies cannot earn even their reduced dividend applicable to the present price of gas, and asked whether the Committee had considered the more simple method of asking for a suspension of the sliding-scale under present circumstances, leaving companies to pay such dividend as they were able to earn, with the proviso that it did not exceed that of June, 1914.

The Chairman, replying to these points, said they did not want to abandon the sliding-scale; but the whole conditions had been altered. The Money Market and the value of money had quite changed; and surely there was nothing wrong in asking for financial relief when an industry found itself in the position that gas undertakings did at the present moment. Within the last few days, the Coal Controller had given another rise of 1s. 6d. a day to the miners; and altogether they were by no means at the end of their difficulties. They did not propose to ask for the suspension of the sliding-scale, for this would, he thought involve a very big principle. Something would have to be put in its place; and the Board of Trade scheme would not undertake to investigate every individual case. The only chance was to suggest some scheme which would cover every case.

Mr. Arthur Valon thought the Committee approached this question with a desire to find something likely to be accepted by the authorities. Looking at the matter all round, he rather agreed that the proper way would be to increase the standard price; but this would mean dealing with each company separately, which would be an impossible task. Most companies, he thought, would be satisfied if they lost only 20 p.ct. of what they were losing at the present time. He entered his protest against any suggestion that because the larger proportion of the increased cost fell upon the consumer, therefore the shareholder had no right to complain. The price of an article was the cost of its manufacture, *plus* interest on the necessary capital involved; provided the consumer paid this, he had absolutely no cause of complaint. He was merely paying the bare cost necessary to supply him with the article. ["Hear, hear."] He gathered that the industry were asking only for this; they were not seeking something additional. Surely this was about the strongest ground that any industry could take; and he did not think the Government or any public department before whom the case was put could deny that it was perfectly reasonable. He hoped the Council would go forward, and felt quite confident that if they did they would be able to obtain a perfectly satisfactory settlement which would meet the wishes of the whole industry.

Sir Fortescue Flannery, Bart., asked whether it was not possible that the Committee could consider the question of financial relief through the Ministry of Munitions giving them payment for the special services they were rendering by the supply of high explosives and fuel materials which the industry gave to the country?

Mr. William Titley (Guildford) thought they had a very just cause. Taking the industry generally, they had not put up their prices anything like other industries. Consumers were only too glad to get the gas, and to pay for it. The great trouble would be, not in getting people to pay increased prices, but in supplying them with the gas they required. He was very pleased to support the resolution.

Mr. H. E. Jones stated that the whole question had been threshed out thoroughly over and over again; and the great thing which made the proposal of the Committee commend itself to one's judgment was that it was automatic. Whatever percentage was asked for could be granted immediately with confidence by the authorities, because they would be asking only for a percentage of that which they had already sacrificed; and the fact that they had already sacrificed it, protected the authorities from any imposition. They must have lost 100 p.ct. before they could ask for 80 p.ct. relief. Before approaching the Government, they had taken the risk; and this was the best guarantee they could have. The proper solution was that the person for whom any article was manufactured should pay the fair cost of producing it ["hear, hear"]; and although they had slightly varied this by the operation of the sliding-scale, it still remained the central principle of all commercial transactions. He thought they were practically unanimous upon the proposal put before the conference.

Mr. A. W. Oke said it was a compromise; and it seemed in the circumstances one of the best things they could agree upon. No industry was doing more than the gas industry to support the men at the front and their dependants, and no industry was having more conditions imposed upon it. This was the most practicable solution they had had before them.

Mr. Robert Hall (Matlock) raised the point of the higher income-tax reducing the net dividend.

The Chairman remarked that there were, of course, many other matters than those he had mentioned which would have to be put before the Board of Trade.

The meeting then unanimously agreed to the first resolution, dealing with the sliding-scale, to the effect that during the continuance of the war, and so long as abnormal conditions obtained, dividend losses on account of increases in price should be limited to 20 p.ct. of the authorized amount in respect of every penny; with the alternative that a company might pay the prescribed standard dividend instead of the dividend herein provided for—whichever might be the greater.

Maximum-Dividend Companies.

The Chairman then submitted the second resolution of the Committee, that any company entitled to pay a maximum dividend should be authorized to raise their maximum price by the sum of 6d., without being under any obligation to decrease the dividend payable in respect of the same half year.

Mr. W. R. Herring (London) suggested "6d., or such larger sum as the Board of Trade may be satisfied is necessary to meet any particular cases."

Mr. R. G. Shadbolt (Grantham) quoted figures to show that, n asking for 6d., they would be in a very strong position.

Mr. T. H. Hazell (Newport) expressed the indebtedness of the meeting to the Chairman for his very clear statement, and to the Committee for their labours. They had very thoroughly gone into these matters, and had come to some practical conclusion; but while the effect of being allowed to put on an additional 6d. per 1000 c.ft. would raise undertakings which could not now pay their maximum dividends into the position of being able to do so, it gave no relief at all on the subject of capital. He would like to ask whether the Committee had considered this point—he was, of course, talking about maximum-dividend companies. If so, were they prepared to suggest any course that would ameliorate the existing condition of things? When they reflected that money could now only be raised at a decrease of 40 p.ct. in value, it was obvious that there was a very serious time in store for companies wanting money in order to enlarge their works. In consequence of munition work being forced on gas companies at the present time, it would be absolutely necessary, as soon as the Treasury gave permission, for a large number of undertakings to expend capital for the purpose of carrying on.

The Chairman, referring to Mr. Hazell's remarks, explained that in some cases gas companies could meet temporary difficulties by issuing bonds or short loans which would be redeemable in a few years.

The resolution was then carried unanimously.

The Case of Municipal Undertakings.

The Chairman said the third resolution was that, in the case of municipal undertakings, applications should be made to the Government for an increase of 6d. in the maximum price, where such existed.

Mr. A. E. Mottram (Ossett) said 6d. would be of no earthly use to many municipal undertakings. They were paying equal to 6d. per 1000 c.ft. increase on account of coal and extra expenses due to the war. On top of this, came a further increase to the collieries—not only miners, but all pit men. This most probably would represent another 2s. 6d. per ton on the coal. Then there was the income-tax and increases for wages and everything else. It looked as though it was before long going to cost municipal undertakings 1s. per 1000 c.ft. extra. Were the consumers to pay this? It had been suggested that some help should be given by way of the sinking fund. If companies were getting some relief, the consumers of corporation gas undertakings should surely have some too.

The Chairman, in regard to this, remarked that companies were only asking for the same relief. If the municipal gas undertakings would meet and formulate some proposal, the Gas Council would be only too pleased to take it up and argue it in the proper quarter; but they could not ask for an alteration of the sinking fund regulations when a large section of the municipalities were against it. It seemed in Scotland they had practically come to the conclusion to apply for an alteration in the matter of the sinking funds; and the Council would do what they could to champion the Scottish cause in this respect. Alderman Phillips, the Chairman of the Salford Corporation Gas Committee, had gone into the question most carefully, and was opposed to interfering with these funds.

Mr. H. E. Bloor (York) said they believed they had an overwhelming case.

The resolution was then carried unanimously.

The Sinking Fund Suggestion.

Alderman F. S. Phillips (Salford), called upon by the Chairman, said among the big corporations he knew, he believed the feeling was decidedly against interfering with sinking funds, because it was going to affect their credit with regard to borrowing. It was a dangerous thing to do.

Coal Prices in South Wales.

Mr. J. Mogford (Briton Ferry) asked whether the Committee had discussed the question of the 2s. 6d. per ton for coal charged in South Wales but not in other parts of the country. Should the Wales and Monmouthshire District Institution of Gas Engineers send a deputation to the Coal Controller, would they receive the support of the National Gas Council?

The Chairman replied that they certainly would. As a matter of fact, the Council had already approached the Controller on this point, and had been told that he would not make any alteration.

The Proposed Deputation.

It was then agreed that a deputation from the National Gas Council should approach the proper authorities on the subject of the resolutions passed at the meeting—the deputation to consist of the Special Committee and certain other gentlemen interested in the subject.

The lengthy proceedings closed with a hearty vote of thanks to the Chairman for presiding, passed on the proposition of Mr. A. E. Broadberry.

A New System of Warming Factories by Gas.—A novel system of warming a two-storey factory, 240 ft. × 40 ft. × 30 ft. high, is described in the Public Service Magazine of the Pacific Coast Gas and Electric Company, by Mr. W. A. Moody. The building is a frame structure, and the walls include 3000 sq. ft. of glass. As the temperature required on the upper floor was slightly less than that for the ground floor, separate arrangements are applied for each floor, and the air in the building can be re-heated and distributed, or fresh air be drawn in from the outside as may be required. The air is caused to pass over heated surfaces by means of fans, and ejected through horizontal ducts extending the entire length of the building. Staggered outlets, with control dampers, are placed at 20 ft. intervals. The combined capacity of the two fans is over 600,000 c.ft. of air per hour, which can easily be raised 20° in temperature during this time, and the maximum consumption of gas is 1250 c.ft. per hour. With an outside temperature of 6° to 8° of frost prevailing for several days, a uniform and comfortable temperature was maintained within.

SIMMANCE'S TOTAL-HEAT RECORDING CALORIMETER.

[Covered by International Patents.]

THIRTY-THREE years ago (1884) we commented in these columns upon a new gas calorimeter placed on the market by by Messrs. Alexander Wright & Co.—this being the first water-flow calorimeter introduced. It was designed by the late Mr. F. W. Hartley, and although many instruments for ascertaining the calorific power of gas have since appeared, none have departed from the fundamental lines of the original Hartley. We now have an opportunity of describing Messrs. Alexander Wright & Co.'s latest development in this direction—a calorimeter invented by Mr. John F. Simmance.

In Mr. Hartley's time, calorific power was practically never tested; and it was regarded as a very secondary consideration. Certainly there was no discussion as to the terms "net" and "gross;" and no clear definition of calorific power was extant till Mr. Hartley read his paper. Matters have progressed, and owing to legislation and other causes, the term "calorific value" as applied to gas, has come to mean the total heat value in gross heat units—the units being British thermal units per cubic foot at 60° Fahr. and 30-in. atmospheric pressure (N.T.P.), or, in countries where the metric system is used, calories per cubic metre at 15° C. (or 0° C.) and 760 mm. atmospheric pressure (N.T.P.).

Simmance's total heat recording calorimeter is designed to furnish automatically a record on a chart in either of these units, and (independently of the record) to enable a calorific test to be made by actual measurements of the gas burned, water heated by combustion of the gas, and the amount of heat so imparted to the water. In other words, it is a standard calorimeter with an auxiliary device recording heat units upon a chart.

It follows firstly, that the record is not obtained by empirical means, but by actually imparting heat to water, and recording the heat so imparted; and, secondly, that the chart reading can at any moment, and without interrupting the record, be checked by or compared with an experiment or test made upon the standard calorimeter of which the recorder forms a part.

The calorimeter yields and the record shows the total heat value of the gas—*i.e.*, the maximum heat value; and the record is independent of changes of gravity of the gas. If gas were burned in a calorimeter without taking any precautions to ensure a proper adjustment of the temperature of the gas, water, and air, and of the amount of humidity of the latter, the test would be rendered inaccurate by the following considerations:

(*a*) The air and gas are frequently of different temperatures initially, which gives rise to an interchange of heat between the inlet and outlet of the calorimeter due to this temperature difference and not to the calorific power of the gas. An error is thus set up.

(*b*) The gas and the air entering the calorimeter to support its combustion carry water vapour in greater or less amounts according to their temperatures and the condition of the weather.

The products of combustion (excess air, nitrogen, and carbon dioxide) issuing from the calorimeter are usually at temperatures different from either of the above factors, and are invariably completely saturated. These differences give rise to errors similar to that referred to in paragraph (*a*).

The heat difference due to relative saturation and temperature of inlet air and outlet products is according to the formula:

$$0{\cdot}6\left\{vz-\left(\frac{q\mathrm{V}}{100}+1\right)w\right\}=\text{heat difference in calories per cubic foot of gas,}$$

where, t = temperature of inlet air.
w = weight in grams of water vapour saturating a cubic foot at t.
V = number of cubic feet of air entering the calorimeter which each cubic foot of gas burned.
q = percentage saturation of incoming air.

(NOTE.—The gas burned in the calorimeter is fully saturated because it passes through a wet meter.)

v = equals number of cubic feet of products leaving calorimeter for each cubic foot of gas burned.
z = weight in grams of water vapour saturating one cubic foot at temperature of outlet products.

The error due to differences in the respective temperatures of air entering and products leaving the calorimeter is in accordance with the following formula:

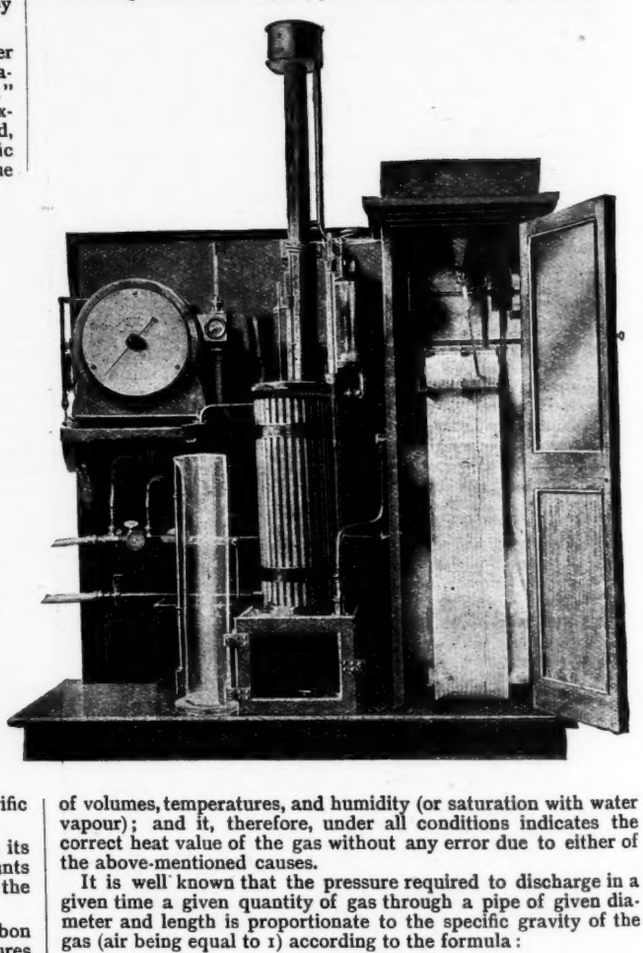
$$\left\{vs-(\mathrm{V}+1)\,\mathrm{S}\right\}\mathrm{T}=\text{heat difference due to sensible heat of products.}$$

where, V = volume of air entering calorimeter as above.
V + 1 = volume of air and gas entering calorimeter as above.
v = volume of products leaving calorimeter as above.
S = water value in kilograms per c.ft. of V.
s = water value in kilograms per c.ft. of v.

(NOTE.—The temperature of the gas has so small an effect that its specific heat can be taken as that of the entering air.)

T = difference in degrees C. between the temperatures of V and v.

Simmance's total-heat recording calorimeter by its construction and operation automatically ensures a constancy or balance



of volumes, temperatures, and humidity (or saturation with water vapour); and it, therefore, under all conditions indicates the correct heat value of the gas without any error due to either of the above-mentioned causes.

It is well known that the pressure required to discharge in a given time a given quantity of gas through a pipe of given diameter and length is proportionate to the specific gravity of the gas (air being equal to 1) according to the formula:

$$p=\frac{q^2g^1}{(1350)^2d^5},$$

where, p = pressure in inches of water.
q = quantity of gas in cubic feet per hour.
g = specific gravity of the gas (air = 1).
l = length of pipe in yards.
d = diameter of pipe in inches.

(*c*) Thus, if the specific gravity increases, the pressure should be increased and *vice versâ*. The pressure thrown by an ordinary governor does not so increase or decrease with corresponding variations in specific gravity, and thus the rate of flow will vary with variations in the specific gravity of the gas.

(*d*) It is also evident that the temperature of the gas and the atmospheric pressure will not remain constant, and therefore, although the rate of flow of the gas may not vary, yet the gas will not be gas at N.T.P. The record is therefore not in terms of gas at N.T.P.

In Simmance's total-heat recording calorimeter a special form of governor is fitted, by means of which both the errors referred to are avoided. The action of this governor is based upon the following formula:

$$(a\,b)\;(s-g)\;t=\mathrm{A}.$$
$$p=w-\mathrm{A}.$$

where, a = distance from point of issue of gas to crown of governor bell.
b = area of crown of governor bell.
g = specific gravity of gas lighter than air at N.T.P. (air = 1).
s = specific gravity of air at N.T.P.
t = tabular number for correction to N.T.P.
A = ascensive force [see explanation of this term later].

w = net weight of governor independently of A.
p = effective pressure at point of ignition.

It will be see from the above formulæ that:

(*e*) A change in g alters p proportionately; and thus the rate of gas flow is automatically maintained constant, however much the gravity changes.

(*f*) A change in t affects s and g proportionately, and alters p in inverse proportion. So that the gas is always passed at a standard rate measured at N.T.P. or its equivalent—being greater if t is less than unity, and less if t is greater than unity. That is to say, a corresponding surplus is burned if the gas volume is expanded, and a corresponding decrement if it is compressed.

(*g*) The record on the chart thus always expresses the heat units produced by the combustion of the standard or unit volume of gas at N.T.P.

The rate of flow which before passing through the governor is measured by being bye-passed through a meter when a standard test is made, will always be found to be equal to c, where t is as above and c the constant rate per hour for which t the calorimeter is set. Thus when the test is corrected by dividing by t (as it must be to reduce it to terms of N.T.P.), the result will be found to agree with the record on the chart which isautomatically recorded in terms of unit volume of gas at N.T.P. If when making a standard test the correction is applied as a multiplier of the observed gas-rate, instead of as divisor of the calorific power, it will be found that with this calorimeter the corrected rate will always equal c.

The term "Ascensive Force" is not usually introduced in discussions on gas apparatus, because this property is not usually employed; but it is the utilization of this force by Mr. Simmance (as explained in his patent specifications) which produces the automatically corrected record of calorific power which has already been described.

As an illustration of what is meant by the term, consider the collection of (say) hydrogen when evolved in the laboratory. It is collected by inverting the bottle, test tube, or other receiver, because the hydrogen being lighter than air will flow upwards by its "ascensive force." A similar method would be necessary to collect any gas lighter than air and issuing from a source without pressure. So it is that if a balloon be filled with hydrogen, it will have an ascensive force equal to the difference between the weight of the volume of hydrogen used and the equal volume of air it displaces. If the balloon is small, the ascensive force will be small; if large, the ascensive force or lifting power will be great. In the case of the gas passing down the vertical tube from the governor in Simmance's recording calorimeter, the ascensive force only operates under certain conditions which are ensured by the design and dimensions employed, and is made use of to produce the effects named above and described in the foregoing formulæ. If these conditions were not present, the ascensive force would not operate properly, just as (for instance) a burner will not light-back when the issuing pressure is great enough to overcome the backward tendency of an explosion.

As the temperature difference to indicate a calorific power of 500 B.Th.U. (4450 calories per cubic metre) will probably be only 10° C., it is necessary for the recording pen to be very sensitive. A change of 0·01 of a degree is quite perceptible on the diagram; and it is therefore essential that all losses from the instrument by radiation should be maintained as far as possible at a constant figure. This is easily effected by keeping the room in which the apparatus is fixed at a constant temperature—preferably by means of a luminous flame gas-stove and thermostat. The temperature of most laboratories is so regulated; but as the calorimeter may conveniently be placed in a small glass enclosure—say, 6 ft. × 8 ft. —in the corner of a large room (meter house, governor house, &c.), the means of heating suggested should be adopted.

The water supply must come direct from the main or from a very large storage tank. The former is the simpler plan. But, whichever is adopted, the pipe must not be a long one, nor traverse the upper parts of rooms where it is likely to be unequally heated. Constant temperature of the inlet water is essential if reliable and quick tests are desired; and this condition may be quite simply attained by a short run of pipe from an underground main.

The gas service must have a constant draught upon it; so that the calorimeter supply is always being drawn rapidly and freshly. The gas to be tested should be taken from a main; and the constant supply will be ensured if the service is continued past the calorimeter burner, and if gas is burned constantly at an auxiliary burner at a point in the service beyond the connection to the calorimeter burner.

Attention to these three points is absolutely necessary. They are obligatory in London testing stations; while if the report of the American Bureau of Standards on standard methods of gas testing is consulted, it will be seen that these three points are strongly insisted upon—particularly the necessity of a constant temperature of the water supply.

The following is a description of the

Working of the Instrument.

Water.—The water enters by the lower of the two connections at the left hand. A union is provided to which a permanent service should be brought direct from a water-main without the intervention of a cistern. This supply will be of almost constant temperature—the variations at different seasons of the year occurring gradually, and thus never vitiating a test. From the point of connection, the water passes upwards to the tall saturating tube, is released to air in the small reservoir, and overflows over weirs in two streams—one (through fine perforations) into the interior channel of the saturating tube, providing a thin annular skin of water right down to the water tank; the other by the right-hand tube, which serves to fill (to overflowing) the water-box containing the cold member of the recording thermometer. The main supply from this water-box is that connected to the calorimeter inlet; and the surplus escapes by an outlet tube leading down to the water tank, and serves to maintain the gas service in action.

The water on entering the calorimeter rises to an open head in the glass tube (which contains the cold water thermometer), and passes down into the calorimeter, through it, and up to a head again beneath the polished wood top which is not air-tight, but only sufficiently closed to prevent the undue cooling of the (then) warmed water. From this head it passes to the outlet spout, and either into the swinging funnel and away to waste, or, by a turn of the funnel, into the measuring glass. It must be noted that no less than four open heads have been mentioned, all at different levels. At each of these, the water is allowed to rise to its greatest possible head (or height), and then fall to the next head by gravity. By these means, a constant pressure of water is maintained at the calorimeter, and further, air in suspension in the water is allowed to escape. The last open "head" (under the polished wood top) gets rid of the last bubbles, evolved by the heating of the water, and regularity of flow is secured. From the water tank a pipe (made of screwed ½-in. iron) must be connected direct to a drain or sink.

Gas.—This must come from a "live" main—one through which gas is passing actively. The pipe to the calorimeter should pass the calorimeter inlet and go on to a burner or stove, or some other means of procuring a rapid flow. The connection (½-in. brass union) for gas is the upper of the two pipe lines at the left hand; and from this pipe line is taken the meter supply, which is thus bye-passed, the gas returning to the main pipe after passing through the meter. Between the inlet and outlet meter branches there is a cock which, when shut, causes all the gas to pass through the meter, and when open, leaves the meter drum motionless—the pressure being equal on the two meter branches. Thus the meter need only be in action during a test; and depletion of the water caused by a constant flow of gas is avoided. A second cock fitted with lever, bucket, and counterbalance controls the further passage of gas. If water is flowing through the calorimeter, some must be overflowing from the constant level tube; and this overflow is arranged to fill the bucket on the cock meter when the gas is on. Should the overflow cease, the bucket empties, the gas is shut off, and it can only be turned on again by hand. Care must be taken to keep this safety cock in working condition. Thus a cessation of the water supply does not mean injury to the calorimeter.

From this supply cock, the gas stream passes to a small dry governor, to dispose of any excess pressure, and thence upwards to the gravity governor where its speed of passage is regulated automatically by its gravity and by the influence of barometric pressure and air temperature. At these adjusted rates, it passes to the calorimeter burner through a ground-in joint, which enables the burner to be swung-out for lighting. As the burner-box will usually be at a lower temperature than the outside air, provision is made in the construction of the burner for dealing with condensed water. The burner is a luminous one—consisting of a ⅜-in. brass tube, encased in a sliding ¾-in. tube; this arrangement being adopted because of the necessity of raising the flame well up in the calorimeter. The burner is lighted outside the burner-box with the outer tube down, and is pushed in until it meets a stop provided. Then the outer (telescope) burner tube is raised, turned till the slot of the bayonet catch is found, moved slightly higher, and turned to its resting place. This raising of the burner should be tried first outside the box; the movement being quite simple and satisfactory. Such an experiment will be very useful, especially as a warning against raising the burner tube rapidly. The flame will be extinguished if raised too hurriedly. The action must be slow enough to permit the gas to fill the tube as it is lifted. When the burner is alight and the door is shut, the flame will be absolutely rigid without any flicker or movement. Its condition can be seen by the aid of the mirror provided.

Air. "*a*"—Air for the combustion of the gas enters at the top of the saturating tower—being naturally at the room temperature, and containing a percentage of moisture, but not entirely saturated. The air in the tube, surrounded by the annular skin of cold water and saturated at that temperature, drops by gravity, and also by the inductive effect of the rising column of hot products over the burner, and passes from the base of the saturating tube into the burner-box. As it falls, it is replaced by new air from the room, which becomes cooled, saturated, and falls in its turn. Thus, whatever the degree of saturation obtaining in the air of the room, the air supplied to the burner in the calorimeter is always saturated at the cold-water temperature. Some of it promotes combustion of the gas, and the products of this combustion, mixed with the excess air, pass up inside the calorimeter, give up their heat, are rapidly cooled in passing the cold base of the calorimeter, and issue saturated at about 1·5° above the inlet cold-water temperature. The necessity for permitting the exit of this slight amount of heat in order to ensure accuracy of results is fully explained in the formulæ of total heat.

"*b*"—The expansion and contraction of air under varying temperatures is utilized in the differential recording thermometer. A

bulb, always immersed in the flowing cold water, is the cold bulb of the differential thermometer. After the water has passed the heating chamber of the calorimeter, it flows round an annular chamber of the same capacity as the cold-water bulb, and this annular chamber is the hot bulb of the differential thermometer. From each bulb, small tubes pass to expansible diaphragms, both right and left hand; the latter being that connected to the hot bulb. When the valve over each bulb is closed, the whole is air-tight; and if all (the two bulbs and the two diaphragms) are at the same temperature, all are at the same condition of pressure. When, however, a difference exists between the temperatures of the water flowing round the bulbs, the diaphragms are expanded or contracted by the amount of air passed into or from them to or from the bulbs. These diaphragms are rigidly coupled in opposition; and the movement of any point on the intermediate coupling rod describes the difference between the amount of movement of each. By attaching a pen to the coupling rod, this difference is recorded; and thus, as the temperatures of the inlet and outlet water vary, so the pen inscribes upon the chart the extent to which the gas combustion has caused the flowing water to be heated.

The Meter.—As has been described, the two branches forming the meter inlet and outlet are separated and turned into a bye-pass by a cock. Thus the meter may be put in and out of circuit at will. The type supplied is one with a capacity of one-tenth of a cubic foot—*i.e.*, a complete revolution of the meter hand indicates one complete emptying of the measuring drum, and the water-line being correctly adjusted, such a revolution means that one-tenth of a cubic foot has been passed to the burner. Should, however, the reading of the barometer and the thermometer show that normal conditions [known as N.T.P.] have been departed from, the one-tenth of a cubic foot is either expanded or condensed, and contains more or less heating capacity than is due to the same volume at N.T.P.

The system of correcting the volume to its proper N.T.P. conditions is fully explained elsewhere; but no correction of the record is necessary—the gravity governor effecting this correction automatically.

MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

AUTUMN GENERAL MEETING IN BIRMINGHAM.

There was a very fair attendance of members at the Autumn General Meeting of the Association, which was held last Thursday afternoon, at the Grand Hotel, Birmingham. Mr. George Stevenson, the President, was in the chair; and in the early part of the proceedings, he stated that the Committee were of opinion that, in view of the strenuous times now being passed through, very few members would feel inclined to contribute set papers, and so the informal discussion of topical matters was decided upon. Several subjects were placed on the *agenda;* and the consideration of these fully occupied the time at the disposal of the meeting.

The Hon. Secretary (Mr. W. G. S. Cranmer, of Willenhall) first read the minutes of the previous meeting; and they were confirmed, on the proposition of Mr. B. W. Smith (Walsall), seconded by Mr. J. R. Duff (Banbury).

Mr. J. S. Cranmer said that, arising out of the minutes, he wished to sincerely thank the members of the Association for their very great kindness in electing him an honorary member. As a founder of the Association, he had always taken the utmost interest in the proceedings, and would continue to do so. He wished it lasting prosperity.

Apologies for Absence.

The Hon. Secretary announced the receipt of apologies for absence from Mr. J. Ferguson Bell, Mr. Thomas Berridge, Mr. George Helps, Mr. Hubert Pooley, and several Presidents and Secretaries of kindred Associations.

New Members.

On the proposition of Mr. F. L. Wimhurst (Newcastle-under-Lyme), seconded by Mr. W. Chaney (Birmingham), the following were elected members: Mr. John B. Balmforth, of Swadlincote; Mr. Michael Dobson, of Uppingham; and Mr. W. A. Twine, of Birmingham.

Election of Office-Bearers.

The Hon. Secretary said they would have noticed from the circular calling the meeting that he had received no applications for nomination forms; and consequently the Committee had nominated the following members to hold office during the ensuing year:

President.—Mr. W. Chaney, of Birmingham.
Vice-President.—Mr. A. T. Harris, of Market Harborough.
Hon. Treasurer.—Alderman W. R. Cooper, J.P., of Banbury.
New Members of Committee.—Mr. E. Parker, of Oakengates; Mr. W. H. Johns, of West Bromwich; and Mr. W. M. Valon, of Stafford.
Auditors.—Mr. H. Banks, of Northampton, and Mr. James Paterson, M.A., of Cheltenham.
Hon. Secretary.—Mr. W. G. S. Cranmer, of Willenhall.

This list was agreed to, on the motion of Mr. W. C. Jones (Brierley Hill).

MARKETING OF BENZOL AFTER THE WAR.

The President said they were all no doubt aware that there had been a Special Committee, composed of members of the gas industry and of coke-oven people, considering the question of the marketing of benzol after the war. A meeting was held at the Offices of the Gas Light and Coke Company; and the Association were asked to send two representatives. Mr. Chaney and himself went; and they had to report that, while nothing definite had been settled with regard to any method of selling benzol by co-operative effort after the war, suggestions had been made by petrol trading companies who seemed very anxious indeed to not only conserve their own interests but to have a share in the distribution of benzol after the war. Certain arrangements had been suggested to the Committee, and the whole matter was carefully discussed. The opinion of the coke-oven people was decidedly that the benzol which would be available for distribution outside the area in which it was produced would be a very small quantity, and would probably be better managed by themselves than by being linked-up to any existing petrol company. Nothing, however, was settled on this point. The output of benzol from gas undertakings was, of course, of relatively small proportions; but there seemed to be no disposition to ally themselves with any of these petrol companies in the matter of its distribution after the war. He understood the Committee would convene a meeting in a very short time, at which they would have further proposals to submit. The whole matter was one that called for deliberate consideration.

Mr. W. Chaney (Birmingham) remarked that he did not know that he could add anything to what the President had said. There was certainly a strong feeling among those present representing the producers of benzol that if they placed themselves in the hands of these big petrol companies, it might end rather disastrously. It was thought that it would be far better to conserve the output of a district and sell it locally.

The President announced that, if a definite arrangement were made, the members would be immediately informed.

COAL SUPPLIES.

The President said he ought to mention that the Committee passed a resolution which they had sent to the Institution, and for which they had secured the active support of most of the other District Associations, suggesting that on the District Coal and Coke Committees some representation of the gas industry was desirable. At the present time, these Committees were composed entirely of coalowners. As he had said, the resolution secured very good support; but nothing further had been heard of it. The Institution had sent it on to the Coal Controller; but nothing tangible had transpired. He supposed, however, the members would give the Committee credit for being alive, and putting forward their needs. He then proceeded to give the members an account of what transpired when the deputation waited upon the Controller of Coal Mines on Tuesday week last, in reference to the Wholesale Coal Prices Order, 1917, issued by the Board of Trade early in September. The Association were asked to be represented; and Mr. Cranmer and himself attended. He remarked that there was a very small report in the "Journal" [p. 65]; and perhaps it was not desirable to say anything in detail. The object in putting this subject on the *agenda* was not to give rise to any hostile discussion, but because it was thought that if experiences were interchanged some benefit might accrue to the members. The Controller had explained that the rates of commission mentioned in the Order were maximum ones.

Mr. B. W. Smith pointed out that they would have to face the question of the recent advance in wages. This was applicable not only to one class of coal, but to all classes. It was an important matter.

Mr. Harold E. Copp (Etruria) said it would be interesting to know whether the Coal Controller had attempted to justify the position he took up in limiting the profit in the case of gas undertakings to 9d. per ton, and adopting the lower figure of 3d. for railway companies. In one of the regulations as published in the "Gas Journal," there was a clause referring to the extra charge which might be imposed for washing fuel. This seemed to open a very big loop-hole. It might lead to unlimited discussion.

The President said that, with reference to the striking difference between the 3d. to railway companies and 9d. to gas undertakings, he understood that the 3d. was previously in operation. It must be admitted that the question of washed fuel did open-up a very big loop-hole.

The Hon. Secretary remarked that not long since he was speaking to someone interested in the coal trade, and was told that some Lancashire collieries were proposing an increase of 3s. to 4s. per ton, to compensate them for having to pay 1s. 6d. a ton extra to the men.

The President declared that he was a great advocate of individual agitation. The more they took the matter up, the more likely they were to be listened to. With regard to the allocation of coal under the redistribution scheme, he understood that some very great grievances existed in the Birmingham district.

Mr. A. T. Harris (Market Harborough) said the effect of the Price of Coal (Limitation) Act had been to raise prices all round. A man who had been buying well and shrewdly had been made to suffer as the result of circumstances entirely beyond his control.

Mr. S. Trow Smith (Malvern), speaking as the Secretary of the Commercial Section of the Association, said that at the last meeting

the question of coal was discussed, and a resolution was proposed which was accepted, but left in abeyance pending the result of the present meeting. The resolution (moved by Mr. W. H. Johns, of West Bromwich) was to the effect that a deputation from the Commercial Section should try to obtain an interview with the Coal Controller, and point out the serious position of gas-works that had not got their ordinary requirements of coal allocated, apart from the extra quantity required to meet demands for munition purposes. The seriousness of the position from the standpoint of the Commercial Section appeared to arise, not out of the price, but of delivery. There were one or two members in the section who had not got coal allocated to them under the coal transport re-organization scheme. Consequently, they were living on what they could get on contracts previously made which had not been cancelled; and the collieries were sending them what surplus they could supply over and above the allocations. It was a very precarious position. They were living from hand to mouth, and had to draw from stock to a very great extent. In many munition manufacturing centres, the demands for gas had increased beyond what had been anticipated; and, while drawing from their stocks, they foresaw that later on, should the transport facilities, as might be expected in the winter, get worse rather than better, they would be absolutely in a hole. The resolution was left over, with the hope that the Association would unite with the Commercial Section, and make the deputation and the protest to be lodged with the Coal Controller so much the stronger. Failing the support of the Association, the section were prepared to go on their own.

Mr. J. F. TYNDALL (Whitchurch) pointed out that, as the result of being allotted less coal than he required, his stock was going to be reduced to the extent of 350 tons in the course of the four winter months—at a period when labour was very scarce. It was not so much a question of the total reduction over the twelve months, as that the biggest loss would be in the four winter months. The case of small works was just as bad, comparatively, as that of big ones. Their allotment was considerably below what it should have been; and they saw no prospect of getting any addition, unless some help could be given by the Association collectively.

Mr. F. C. BRIGGS (Dudley) said he was in the fortunate position of having all his contracts in districts allotted to him; but during the last fortnight supplies had not been coming in, and he had been taking from stock. He thought the reason was that the Coal Controller had been forcing his collieries to send coal to someone else to whom it had been allocated. It was unfair that, under a new scheme like this, the collieries that had been supplying them for a considerable number of years should have to stop their supplies under existing contracts which had been allowed by the Coal Controller.

Mr. H. J. WOODFINE (Wellington) said information would be interesting as to the basis of these allocations. They had been taking practically the whole of their coal from North Wales; and now they had to go to North Staffordshire. He found the allotment made to North Staffordshire to replace the North Wales coal was on the basis of 20 p.ct. off the June delivery. This had placed him in a very awkward position; for he had one big contract which expired that month, and got very little coal on account of this contract. Taking it altogether, he was getting 50 p.ct. only of his requirements; and it was impossible for him to carry on under these conditions. It seemed to him peculiar that 20 p.ct. should be taken off the June deliveries; but one could get no satisfaction. ["Hear, hear."]

Mr. W. H. JOHNS (West Bromwich) said he did not think any good could be done by discussing the question and individual members stating the amount of the arrears that their contracts were in, and the shortage they were expecting over the winter. The great point was this. He took it they were all short of coal. ["No."] Well, at any rate, he thought the great majority were short. Was this coal going to be obtained for the gas industry, or was it not? He was in the same position as Mr. Woodfine. He had written to the various Coal Committees, and had reported the matter to the Coal Controller, and asked him where they should get it from. Were they going to sit in their offices and twiddle their thumbs, or were they going down to get it now? The electrical engineers were getting their coal, and everything else they were asking for. The gas managers were giving all their spare time to help the Government, in the shape of supplying tar, oils, gas, &c.; and what were they getting in return? They could not get even their raw material. The gas industry as a body was not strong enough. Therefore he proposed that the Association should write to the National Gas Council—who he saw had now taken the matter up—emphasizing the necessity of immediate steps being taken in order that gas undertakings might know where they were going to get the raw material necessary to enable them to carry on existing business. New business could not be considered at all. A letter should be sent out from the Association to the other District Associations, with a view to pressing the matter on the attention of the National Gas Council in London. At the present time it was not a question of London, but of the Provinces. They were 5000 tons short at West Bromwich; and up to now they had not been allocated anything on account of this loss. They ought to have help from those in power to get the raw material they required. Otherwise some of them would be obliged to reduce their pressures, and the electrical people would step in and take a good deal of the business from them which they had been struggling for many a long time to maintain. He would ask the Association as a body to assist the Commercial Section by taking this matter up. It was a very serious question; and personally he did not think that the gas industry as a body had up to the present time looked upon it in the way many traders would have done. If they did not take some steps, much of their business was going to be stopped.

The PRESIDENT said that, as regarded the present meeting, they would be quite willing to collaborate in any way; but he suggested that, if they were to make any representations, they should go accompanied by facts. If members were circularized to ascertain shortly their present position, they would have something to talk about. It was not the slightest use going on generalities. ["Hear, hear."]

Mr. C. M. D. BELTON (Shrewsbury) remarked that his particular case was as serious as others. They were 500 tons a month short in their allocations. The actual allocation under the Coal Controller's scheme was 50 p.ct. of their monthly quantities. They had been able to extend this to two-thirds; but beyond that, they could not go. The District Committee had been approached; and they had stated that they had allocated all the coal at their disposal. They had approached the Coal Controller himself; and he had said that he could not go any further. It was unfortunate that the allocations should have been made on the June delivery—this being a small one in his case, as in others. But allocations were supposed to be a minimum; and they were to be at liberty to purchase extra quantities. This was ridiculous, because the coal was not available in the permissible areas. The whole thing seemed absurd, from their point of view. Had the matter been left alone, everyone would have got his coal; and why could they not have it now? They had to extract benzol and toluol, &c.; but they could not get their raw material. They needed some very definite and strong action: and it ought to be taken soon, or many of them would be out of stock altogether.

AN OPTIMISTIC VIEW.

Mr. JAMES PATERSON (Cheltenham) said he was not in the position he had hoped he might have been to give words of comfort and assurance to the members. He was sorry that Mr. Glover was unable to be present, because they knew that he represented the gas industry in the Coal Controller's office. Personally, he (Mr. Paterson) was well assured that the coal they required would be forthcoming. They might say that this was nothing more than a comfortable assurance; but it was no more than a comfortable assurance that he had received in the matter. He did, however, know that the controlling authorities, speaking generally, were fully aware of the importance of the gas industry at the present time, not only from the point of view of meeting war needs, but from the more prosaic standpoint of the public supply. Before the transportation re-organization scheme came into operation there was enough coal; so that it was obvious there must still be this coal, even though, under the present scheme, it did not appear to be forthcoming. He was quite certain that the difficulties the Coal Controller had to face were very great; and it must take time before complete satisfaction could be given. Personally, he was of the opinion that stocks would be reduced. He was losing stock to-day, in a town with practically no war requirements. But he was returning his stock every week, and these figures were carefully tabulated in the Coal Controller's department. There must come a time when special consideration had to be given to this or that undertaking. They in the Midlands were not in the position of those companies who, before the war, at any rate, got most of their supplies by water. The position of those undertakings in the early part of the war was alarming indeed, owing to the impossibility of bringing the coal by water. But the position was met. Until they themselves got to the low stage that had been reached by the undertakings to which he referred, he did not think they had very great cause for alarm. They were losing their stocks daily; but surely the position would be dealt with. One point which had been mentioned before was that the allocations in some cases did not fully replace the cancelled coal; but this, he imagined, would be met as time went on. These things could not be done at once. It was a huge scheme; and it had not been in existence many months. He might be called an optimist; but he was on fairly safe ground, he thought, with the assurance he had that the coal would be forthcoming. The thing, it seemed to him, was for each individual undertaking to "knock at the door," and try to get relief. It was only by continually quoting actual facts that the point could be brought home to the authorities. Until this re-allocation was fully completed, they could not consider themselves in a satisfactory position all round; but he did believe that the supply of coal to the gas industry generally was regarded as of such paramount importance that eventually the difficulties and the discrepancies would be righted.

Mr. WOODFINE: Then why does not the Coal Controller say so?

Mr. PATERSON replied that he did not know. He thought if a case was made out by the Association, and backed-up with concrete facts, it could very well be presented. Beyond this, he did not see what they could do.

Mr. JOHNS said it was a question of getting some kind of coal. He had not had one ounce of coal offered to him in place of that which he had lost; and he thought they had better start "knocking at the door" immediately. At the same time, he was quite prepared to "push his own barrow." He did not think a business man would be inclined to take anything for granted that was not in writing. If Cheltenham cared to wait, he did not see why the Association should think of tarrying.

Mr. J. T. LEWIS (Wellingborough) said he did not want to appear to be in opposition to the resolution; but he did think with the President that as a preliminary they should have a statement from members of the Association, so as to guide the Committee in their action. If a return was made at once by every member, stating the quantity of coal that was required for each month (say) for six months, the quantity of coal which was allocated to them, and also the stocks they now held, and this information was tabulated, the Committee would be able to see whether works in certain towns needed more coal or not to keep them safe over the winter. They would then have definite facts to put before the Controller, and could, if deemed desirable, approach him with any resolution. He moved a resolution to this effect.

Mr. WOODFINE said the Coal Controller and the Coal and Coke Supplies Committee had tabulated figures before them; but still they could not get satisfaction.

Mr. W. C. JONES (Brierley Hill) seconded Mr. Lewis's proposition, and at the same time he would support the resolution of Mr. Johns, which he was sorry had not been made even stronger. He was not at all sure whether good would come from submitting it to the National Gas Council. He would have preferred that the Association should have dealt with it direct, and been prepared to say what they would do in the event of their requirements not being met. ["Hear, hear."] It was a fact that the electric light companies were taking advantage of the business of the gas companies being brought to this position, and were getting custom which in other times would have remained with gas.

Mr. B. W. SMITH said there must be some concrete figures to work upon, and they could be obtained by the Secretary. Why should they delay the matter until after these figures had been considered by the Committee, and then afterwards decide whether or not they should approach the Controller? This would be loss of time.

The Hon. Secretary: With reference to the suggestion for obtaining these particulars, do you not think it would be advisable to invite other Associations to adopt a similar arrangement, and to put in a collective application?

Mr. Woodfine: Are they short elsewhere?

The Hon. Secretary said he presumed they all had difficulties. In his own case, they required 10 p.ct. more retorts to make the same quantity of gas. They were not short of coal; it was the quality that was at fault. In the case of the resolution which the Committee sent up to the Institution, with reference to representation on the local Coal and Coke Supplies Committees, copies were sent to the Secretaries of the other District Associations, with the request that they should back-up the Midland Association in the matter; and they did so. He thought that their case should be put collectively to the Coal Controller.

Mr. S. T. Smith remarked that, with regard to asking other Associations to join them, he thought he might say that the Midland Commercial Section would be strongly opposed to the delay which would ensue through the adoption of such a course. Their opinion was that the subject was one which would brook no delay.

Mr. Vincent Hughes (Smethwick) said he had listened attentively to the remarks that had been made; and his sympathies were very much with Mr. Paterson. They had a National Gas Council, and representatives on it, and had appealed in various directions to the Coal Controller; and he really did not know why they should disturb themselves in this remarkable manner. What were coal stocks for but to fall back upon in case of emergency? His own stocks were very much below previous years; he was receiving very much less coal. At the same time, he had to meet an increase of something like 25 to 30 p.ct. in the output of gas. He would be very much in the dark before February. But he took it that the National Gas Council were looking after the interests of the gas industry. All the resolutions they themselves could pass could not improve matters. That very morning he had had a very encouraging letter from the Coal Controller, in which he said he noticed that the Smethwick supplies were very much short; and he was looking into the matter, and giving instructions that these supplies should be increased. He thought every member was in the same position; and that when the Coal Controller found that there was a serious situation, the coal would come along. The resolution needed framing in a somewhat different manner.

Mr. Chaney was rather glad to hear the remarks of Mr. Hughes. He himself was a bit of an optimist, and could quite conceive that this was a tremendous job for the Coal Controller. It was a war remedy; and it could not be carried out in a day. The whole of the coal that went to the South Coast and the Southern Counties was carried by boat. London and its neighbourhood, he supposed, had as big a claim on the Coal Controller as the Midlands had; and they in the Midlands were very much better off than their brethren down South. This being so, he certainly was of opinion that it would be rather retrograde not to be contented with the action of the National Gas Council, who, he believed, had the matter strongly in hand. He did not think any of them could say they were absolutely short of coal. What they could say was that their stocks were low. Probably they had about one-half as much as they ought to have. They could not expect to have the same amount of coal in their yards in war time as they would like. But the Controller knew all about it; and if they left themselves in his hands, or put their representations before the National Gas Council or the parent Institution, they could say they had done whatever could be expected of them.

The President remarked that they had two resolutions, both tending towards the same end. The first was proposed by Mr. Johns and seconded by Mr. Belton; the other was proposed by Mr. Lewis and seconded by Mr. Jones. As he (the speaker) understood, the position of the National Gas Council was that national affairs relating to gas were transacted through them. They were looked upon by the Government authorities as representing the national gas industry; and he believed they were fully alive to the question of coal. He thought the Midland Association should themselves send to the Coal Controller a collective note as to where they stood. It would be no slight upon the National Gas Council or the Institution, because going to either of these bodies meant delay. He felt himself that they would all get supplies.

The two resolutions were then unanimously agreed to.

The President said the Association, in conjunction with the Commercial Section, would send out a circular, and see how every member stood. They would ask: (1) The quantity of coal allocated per month; (2) the quantity of coal required; (3) the percentage increase or decrease in expected output over the next six months; (4) the amount of stock. In answer to a question, he agreed that Mr. J. Ferguson Bell, of Derby, should be co-opted on the Committee for this purpose.

PERMITS FOR GENERAL GAS-WORKS REQUIREMENTS.

The President said the Committee had had from the Wales and Monmouthshire Institution a resolution which they had adopted to the effect that all gas undertakings should be certified automatically; and the Committee had great pleasure in supporting it. It was sent on to the National Gas Council, who replied saying that the matter had already "been taken up with an official of the Ministry of Munitions, who stated that it would be necessary to consult the War Cabinet. Subsequent developments, however, have gone a long way to strengthen the claim of gas undertakings to retain all available men; and we have the assurance of the Ministry of Munitions that no further men will be removed from undertakings who agree to produce the utmost possible quantity of tar for the Ministry." It was felt, added the President, that certified undertakings were getting very much more advantages in the way of goods and plant than were others.

Mr. J. F. Tyndall (Whitchurch) said the question of obtaining reasonable supplies of meters was one of the urgent problems of the day to most gas undertakings; and, at the request of the President and the Committee, he wished to bring to the notice of the members a scheme recently sanctioned by his Board, by which they hoped to somewhat relieve the strain, and incidentally to reduce the ever-growing item of repairs and renewals in the revenue account. This latter item, for the half year to June, had reached a figure of 2·32d. per 1000 c.ft. of gas sold; and as meters were supplied free of rent, this alone demanded serious attention. Gas was supplied at differential rates for lighting, cooking and heating, and power purposes; and up to the present the various supplies had all been separately registered. Power supplies would continue to be so; but the lighting, cooking, and heating would, so far as new apparatus was concerned, be based on an assessment scheme set forth in the following circular-letter to the consumers.

Additional Meters on Gas Cookers and Fires.

In order to curtail as much as possible the length of time occupied in reading gas-meter indices, and to overcome the shortage of gas-meters, the Company propose, where an additional meter would be required for gas cooking or heating purposes, and with the consent of the consumers, to assess the quantity of gas used for lighting, by taking an average of the last three years as recorded in our books—or, in the case of new consumers, by estimating such average under similar circumstances of use, and charging that quantity at the lighting rate, with all additional gas registered on the same meter at the cooking and heating rate.

In your case, the readings of the lighting meter over the past three years show an average consumption of c.ft. The Company therefore propose that one-half the above yearly consumption be charged you half yearly at the lighting rate, and all registered above that quantity at the reduced cooking and heating rate, in lieu of the additional meter, until such time as either yourself or the Company desire to end the arrangement, by giving three months' notice in writing in either case.

If it is your wish to assist the Company in meeting the exceptional conditions of labour and material shortage of the present time, you are requested to tear off and post or deliver the perforated portion below, duly signed and dated, to form the basis of agreement to the terms set out above.

Any exceptional circumstances will be met by an interview with the undersigned, on application. J. F. Tyndall, Manager.

Whitchurch (Salop) Gas Company, Ltd.

He claimed no novelty for the scheme; for, to his own knowledge, similar schemes had been in operation for the last seventeen years in certain Irish gas-works controlled by his late chiefs, Messrs. Anderson Bros. At this time he thought it had special force where a difficulty was being experienced in obtaining new meters for other than renewal purposes. The scheme was based on a purely business proposition—that having assessed a given amount of gas consumption for lighting purposes, the Company offered all registered over this quantity at a reduced rate. Having thus secured a minimum cash return to cover standing charges, they offered an inducement to extend the use of gas at a cheaper rate through the same service and meter. In this way, they hoped to save capital outlay on new meters and subsequent maintenance charges, and to reduce fixing costs, meter-reading work, and rental clerical work. Though the scheme was put forward at present merely as a war-time measure, it might, if found satisfactory, develop into a permanency. It was, of course, open to abuse; but both the Company and the consumer were safeguarded by provision for three months' notice to terminate the agreement under any abnormal conditions which might arise. Once an assessment was made, they did not propose to inquire too stringently how additional consumption might occur. The difference in cost to the consumer was only 5d. per 1000 c.ft.; and it would take a good deal of gas to neutralize the cost of (say) a 5-light meter, with its main-cock and compo. pipe, and the fitter's time fixing. The only other thing besides meters with which they had difficulty was compo. pipe. They were absolutely refused another pound for any purpose whatever. He did not know whether the Association could help them.

The President remarked that Mr. Tyndall's scheme only applied to those undertakings which charged differential rates for lighting and cooking and heating. He had overcome the difficulty of not being able to obtain new meters by doing without them. As to compo. pipe, the Committee had tried to do what they could, but were unable to offer any help. Some members could obtain compo. pipe, under certain conditions.

Mr. C. M. D. Belton (Shrewsbury): What are the conditions? We have put up a strong case, but are absolutely short of it.

Mr. W. H. Johns (West Bromwich): If you make repeated applications for small quantities, you will get all you want; but you cannot obtain it in large amounts.

Mr. C. H. Carder (Oldbury) said that, as a means of reducing a very heavy capital outlay on meters, he had had to do the same thing. When he went to Oldbury, he moved nearly a thousand secondary meters and fixed them as primers. They allowed an additional 2½ p.ct. discount on accounts if paid in the ordinary period. After three years the scheme fell through, and they came on the flat-rate.

The Hon. Secretary said he had been trying to obtain a permit for a booster, and eventually got a P. 5. He paid a second visit to the Priority Office; and was told that it was quite impossible to give him anything higher, as the material was wanted for munition work.

Mr. F. C. Briggs (Dudley) said that after eight months' pegging-away, he obtained permits in August in connection with a water-gas installation. They gave him P. 4 for the whole plant; but he had persuaded them to let him have a P. 2 permit for the boilers and certain steel work. This, of course, was done entirely on account of the large amount of munition work in the town. Could anyone give him information as to a new Lead Order which was said to have been issued, with severe penalties attached for using lead, even for paint? Did this apply to lead for mainlaying, because he had quite a lot to do in connection with this new plant?

Mr. R. S. Ramsden (Burton-on-Trent) inquired whether anyone had been able to get any kind of priority for tins for gas-cookers, and if they had been able to obtain the tins.

Mr. W. M. Valon (Stafford) asked whether the P.2 permit made any difference in getting the material. He was having vertical retorts put up, which were to be completed early in 1915. They were not finished yet; but he went to the Ministry of Munitions dozens of times. First he got a P.3, and then finally a P.2; but this was four months ago. The makers said they would finish the retorts by the end of this month, but had not got the material yet, and this was P.2. As to Mr. Ramsden's question, he himself wanted to use tin for an important munition purpose; but they refused to give them tin for this. They said some other material that was not tin must be substituted.

This was a difficulty that could be got over; so that they would not give it. Members would not get tin for cookers at all. He had a gasholder waiting for 10 tons of material; and it had been waiting for eighteen months.

Mr. Briggs added that, as the result of the P.2 permit, the boiler plates were delivered within a fortnight. As he had said, he had a good many munition factories in his district, and a 60 p.ct. increase.

The President regretted that he did not know anything about lead for mainlaying, but promised to make inquiries of the National Gas Council and let Mr. Briggs know.

Mr. Vincent Hughes (Smethwick) remarked that he applied for 2 tons of pig lead. At first he was refused altogether; but after considerable delay they granted him a permit for half-a-ton of lead wool, and he had this.

GAS FOR MOTOR VEHICLES.

The President said the use of gas for motor vehicles was a topical subject; and one or two members had had practical experience with regard to it. They would all have noticed in the current issue of the "Gas Journal" that the Manchester Gas Committee had had a specification drafted for this particular business, setting out standard sizes of fittings for filling the containers. A meeting with the same object was recently held in Birmingham; and Mr. Chaney would probably tell them what took place. Mr. Dougall, of Kidderminster, had also had experience.

Mr. W. Chaney (Birmingham) said that when the question of gas fuel for motor vehicles was first mooted, several concerns in Birmingham went rather deeply into the matter; and it began to be realized that it would be a very big thing. Really, what it meant was that, if the whole of the tramcars and omnibuses in Birmingham were to take gas, it would necessitate finding a further 5 million c.ft. of gas per day; and Captain Hilton thought it would, perhaps, be beneficial to their neighbours if they had a meeting in Birmingham to ascertain whether they could standardize parts or come to some arrangement as to charges, so that vehicles could travel from one district to another, and feel sure their fittings would be of use. The only thing they practically agreed upon was a standardizing of the unions. It was found that it would not be possible to charge a uniform rate; but he believed there was now a system in vogue whereby a token was used in place of payment. He presumed there was a sort of clearing house, and the profits were divided-up. Birmingham had four filling stations; and it was rather difficult to keep a check on the number of fillings of the bags. Mr. S. R. Barrett had, however, devised a cheap and useful means of doing this. Many experiments were being made to ascertain whether the unsightly gas-bags could not be done away with. It was a very big proposition, when one considered that a cylinder 10 feet long and 3 feet in circumference would hold about sufficient gas to carry a vehicle 15 miles; and if this gas was compressed under fifteen atmospheres, which meant something like 200 lbs. per sq. in., there would be only enough gas to take an ordinary vehicle 90 miles. Therefore he thought the problem of using cylinders was a very difficult one; and the lines on which they were working, he believed, were that they were making a bag out of some sort of rubber, and winding it with steel wire, very similar to the construction of a gun. Whether anything would come of this was a question which time would settle. In Glasgow, they were supplying gas at 70 lbs. pressure in these bags.

Mr. P. Dougall (Kidderminster) said they were forced into using gas for motors, and fitted them up with bags; and they had run fairly satisfactorily. They simply put the gas-pipe into the carburettor. On the first motor, they did not get it in far enough, and had too weak a mixture; and on the second one it was too far in, and the mixture was too rich—the bag emptying in no time. What had been advocated in the Technical Press had been that they should connect-up with an extra tube into the manifold induction. He had tried this on a motor they did not get a good enough mixture of the gas and air. To his he recently bought, but found it did not work satisfactorily, because mind, they needed a very long mixing chamber; otherwise they were wasting their gas. Another trouble they had had was a lot of back-firing, after they had worked for three or four months. This got so bad that the Chief Constable threatened them with proceedings. They hunted everywhere for the cause of the trouble, and found it was due to the sparking-gaps being too wide. The car would run on petrol, not on gas. The minute they closed the gaps, however, it ran on gas as well as on petrol; and there had since been no trouble. Without uniform fittings, there was bound to be trouble. Running light, he could do 10 miles on 250 c.ft., or 8 miles with a 30 cwt. load. The selling price for gas was 2s. 10d.

Mr. R. S. Ramsden (Burton-on-Trent) remarked that in Manchester they were proposing to use a 100-light meter, under circumstances which would constitute a very heavy over-load for an ordinary 100-light meter; and it would be of general interest if information could be given to show how and why it was that an ordinary 100-light meter could be obtained to pass 1620 c.ft. an hour. If such a thing were practicable, he thought it would revolutionize the standard by which meters had been gauged, not only for motor-car bag filling, but for general purposes. Another point was in connection with the advertisements of the people who were making these bags. They said that gas for a motor-car was equivalent to petrol at 6d. per gallon, without stating the price of gas. The general practice was to charge 4d. per 100 c.ft., and reckon from 250 to 300 c.ft. as being equivalent to a gallon of petrol. This worked out to about 1s.; and he thought that if these gas-bag makers were out for getting business by gulling the public into thinking it was going to cost only one-half of what it would cost, it would not be good for the gas industry. It would be well to correct this.

Mr. W. M. Valon (Stafford) said he had been making a few experiments in this connection. He had seen a car on show fitted with compressed gas in a special cylinder weighing 85 lbs. and containing some 250 c.ft. of gas at 120 atmospheres; but it was tested to 300 atmospheres before it was sold. Two of these cylinders weighing 170 lbs. would carry 500 c.ft. of gas; and with anything like an efficient gas supply it did not take 250 c.ft., but just under 200 c.ft., to equal a gallon of petrol. He could get with an 18 h.p. automobile an equivalent to a gallon of petrol with 195 c.ft. of gas. He quite agreed with Mr. Dougall that it was a mistake to put the gas in the manifold pipe higher up; they wanted a longer period of mixing. He had run with a carburettor which had an open end for air; and the best efficiency was obtained with the gas-pipe inserted into the air pipe. The gas-pipe was ⅝ in. internal bore, the air-pipe was 1¼ in., and it was inserted into the centre, and carried an inch in. Some of the big firms were running their power tests on gas; and he believed up to recently 85 p.ct. was considered a good figure. If one got 100 h.p. with petrol, it was 85 h.p. with gas. But in some experiments he had been carrying out, he had succeeded in getting no less than 93 p.ct. efficiency. It appeared to him to be a matter of carburation. If they got their gas and air somewhere where it ought to be, they obtained very near full efficiency out of the engine. It would be a great thing if the Association would get gas companies and corporations in the Midlands to make a uniform charge for gas. He did not think they ought to supply it at power rates ["hear, hear"], because it was only an intermittent load. There was also the cost of the installation to be considered. Taking all things into account, and looking at the ordinary prices, he thought a very fair figure for the Midlands was that mentioned by Mr. Ramsden, of 4d. per 100 c.ft., which meant practically 10d. per gallon of petrol. Would it not also be possible to get the members who had put up filling stations to intimate the fact, so that a complete list of these stations could be drawn up and sent out to the motor press? The flexible container he regarded as merely temporary. No doubt it would come to compression in the end.

The Hon. Secretary said the question of the charge for filling was discussed at a meeting of Birmingham district members held about a fortnight previously; and the conclusion they came to then was that it was impossible to have a uniform price. There was such a difference in the cost of manufacturing gas. The cost of filling the bags in various places would be bound to vary. There was the fitter's time, which would have to be added to the cost of the gas. He thought they had got to charge a price which was really in excess of the ordinary price for gas. Power rates would be entirely out of the question; and the lighting price would in many instances be much less than they ought to charge. He thought 4d. in some cases and 5d. per 100 c.ft. in others should be the minimum figures. He understood in some places a charge of 4d. per 100 c.ft. was made, with a fixed price in addition—9d. in one case. Some of them did not want this extra custom. They had quite enough to do without running themselves into further responsibilities.

Mr. James Paterson (Cheltenham) pointed out that when they talked about uniform prices for gas, they must not forget that there was such a thing as calorific value. Where prices differed, the higher price might also mean a higher calorific power.

Mr. A. T. Harris (Market Harborough) said he had fixed 250-light meters in garages. In this way the Company were relieved of all responsibility in connection with filling; and they supplied the garages at the power rate—suggesting that the owners should fall into line with Leicester and other towns by charging 4d. per 100 c.ft. This gave the garages a profit of 1s. per 1000 c.ft. They were already very short of labour; and motors would come along at all times. The garages had their own men; and he was a strong believer in small towns, where there was not a big staff at the gas-works, making it worth while for the motor-garage people to do this work for them.

Mr. C. H. Carder (Oldbury) asked why makers should not be induced to standardize the capacity of the bags.

Mr. S. T. Smith (Malvern) said that in the course of the next fortnight he hoped to have a motor-lorry driven by gas. Speaking of the demonstration of gas-driven vehicles in London which he had visited, he said the whole of the engines ran beautifully; and it seemed to him the makers had so far got over the difficulties that, no matter where the gas was admitted, the engine ran well. As gas suppliers, they were under a certain amount of obligation to the Motor Press for promoting this demonstration for the advancement of coal gas as a motor fuel.

The President said he was in at the birth of these gas-bags two years since. He saw the first made, and ran on the car with it. If it was to develop into a big business, standardizing the bags, and filling them at so much each according to their capacity, was the simplest way of dealing with the matter.

A hearty vote of thanks was, on the proposition of Mr. Harris, seconded by Mr. Duff, accorded to the speakers who had brought forward the various subjects.

Coal Storage under Water.—Some time ago the City Electrical Engineer represented to the Municipal Council of Sydney (N.S.W.) that the members of the Council appeared to regard his proposal to store coal under water as impracticable. At the time he made the proposal he did not know of a case in which this method had been adopted, except in an experimental way in Malta by the British Admiralty. Now he reports to the Council details of a pit 150 ft. by 800 ft. and 25 ft. 6 in. deep to provide for the storage of 100,000 tons of coal, submerged in water at the works of the Duquesne Light Company, of Pittsburg.

British Commercial Gas Association.—The sixth annual meeting of the Association will be held on Wednesday, the 31st inst., at the Royal Society of Arts, John Street, Adelphi, W.C., to transact the following business: To consider and if approved adopt the report of the General Committee and the statement of accounts to Aug. 31; to elect a President and Auditors for the ensuing year; to consider the following motion: "That, in view of the continuance of the war, the retirement from office of those members of the Executive and General Committees who would otherwise have retired at this meeting, be postponed until the annual general meeting in 1918." There will also be a discussion on the question of "Coal Gas for Motor Traction—During and After the War."

GAS-DRIVEN MOTOR VEHICLES.

Conference at Manchester.

Under the auspices of the Manchester, Liverpool, and Counties Commercial Motor Users' Association, a meeting was held at the Midland Hotel, Manchester, on Friday, to further consider the question of utilizing coal gas for motor traction. The attendance numbered between 450 and 500; and among the visitors were many members of the Manchester District Institution of Gas Engineers, as well as Chairmen of Corporation Gas Committees; the towns represented including Manchester, Liverpool, Stockport, Bolton, Oldham, Wigan, St. Helens, Warrington, Rochdale, Farnworth, New Mills, and many others. Commercial motor owners, private motorists, and motor manufacturers and agents from South Lancashire, Cheshire, Derbyshire, and Wales comprised the majority of the audience, albeit there was a sprinkling of Metropolitan motor enthusiasts in the densely-packed Banquetting Hall. The Manchester Corporation Gas Department [whose encouragement of the enterprise was referred to in the "Journal" for Sept. 11, p. 479] were represented by the Chairman (Alderman Wm. Kay, J.P.), the Deputy-Chairman (Alderman Richard Burtles), the Superintendent (Mr. Fredk. A. Price), and Mr. W. M. Barrettt, of the High-Pressure Gas and Lighting Installation Department; the last-named gentleman having accepted an invitation to deliver a lecture (illustrated by lantern slides) entitled "Coal Gas for Motor Traction."

Mr. Leo Swain, the Chairman of the Association, presided in the unavoidable absence of the President, Mr. W. Joynson Hicks, M.P.

Government Approval.

Prior to the lecture, Mr. E. S. Shrapnell-Smith, the Petrol Economy Officer, alluding to the Government Control of petroleum, &c., under the direction of Professor Cadman, said that Mr. Walter Long had entrusted him (the speaker) with the responsible work of introducing further economy in the consumption of petroleum oils and petrol in the Services, and in all other practicable directions. He was instructed to say that both Mr. Long and Professor Cadman were much interested to know of the activities of the Gas Committee of the Manchester Corporation in the matter of arrangements to encourage and provide facilities for the consumption of ordinary town gas as an alternative fuel in relief of the petrol situation. Mr. Long wished him to say that the projected co-operation in this matter (regarding the arrangements for refilling gas containers and other points of working detail) between the Manchester, Liverpool, and Counties Commercial Motor Users' Association and the Gas Committee of the Manchester Corporation met with hearty approval. He hoped it would be generally realized throughout the industrial areas of Lancashire and Yorkshire most particularly that the saving even of one gallon of petrol had a direct influence on the cost of food. "That gallon is enough to take three tons of food eight miles," he added. The extending use of ordinary town gas, which might be said on the average to cost less than one-third as much per mile run as would petrol for corresponding work, promised to be of the greatest national importance. It was hoped that many thousands of commercial motors would be equipped to run on town gas within the next few months; and the Petroleum Executive were confident that the Manchester district would take a leading place in such developments. He was asked to point out the error of the view that gas traction was to be regarded as merely a war-period expedient. They were, in fact, concerned with a development of lasting economic importance in this respect. When materials and labour became available to permit the general use of gas under compression, the limitations which were at present imposed by its use on the vehicle from flexible holders at practically atmospheric pressure—limitations of space and radius of action—would be overcome. Town gas could then be utilized to full advantage, especially having regard to reductions in the accepted weights of cylinders, due largely to the employment of high-tensile steel instead of mild steel. Not only should town gas enable economies to be made in the cost of transport; but the margin of saving compared with the cost of petrol should be high enough to leave available a handsome contribution from motor traffic towards the reconstruction of roads without unduly hitting haulage interests. For example, it was established that the saving, taking petrol at only 1s. 6d. a gallon and gas at 3s. 6d. per 1000 c.ft. of free gas (including the cost of compression), would be about 1d. per mile-run for a 3-ton lorry or a standard motor-omnibus. The assumed pressure was that recommended by the British Commercial Gas Association—viz., 25 atmospheres. Finally, he wished to ask that every consideration should be given to the likely benefits of using a home-produced fuel, and, above all, one which distributed itself. There was no finer pipe-line system in the world than the mains of British gas undertakings, and no other fuel could be applied without added expense and ceaseless demands upon both materials and transport for its own distribution. The new Petrol Restriction Order [published in the "London Gazette" of Saturday last] would not apply to gas.

COAL GAS FOR MOTOR TRACTION.

Mr. Barrett then delivered his lecture, of which we give the following extracts.

The use of coal gas for power purposes is many years old; and its practicability and efficiency for driving internal combustion engines has been proved over and over again. I need only refer to the efficiency and reliability of the gas-engine to prove this statement. If further proof is needed, reference may be made to the practice among makers of "running in" automobile and aeroplane engines with coal gas.

During 1915, the Government decided to place restrictions upon the use of petrol; and among other regulations the use of petrol was prohibited for char-a-bancs. This brought home to owners a realization of the stupendous demands upon our limited petrol supplies, and the necessity for securing a lasting and efficient substitute. Coal gas naturally was considered; but for some time the question of storage stood in the way of its application. To Mr. Barton, of Beeston, must be given the credit of providing a solution of the difficulty. It is worth noting that in his earliest experiments Mr. Barton used gas compressed in steel cylinders; but, owing to difficulties experienced in breaking-down the pressure, he decided to store the gas in a flexible bag carried on the roof of the vehicle.

The first coal-gas driven motor to run in Manchester was fitted with one of Barton's circular containers. There were many practical disadvantages of using the circular-shaped containers, not the least being the tendency of the container when partly deflated to drop over the side of the vehicle (unless the driver took a reef in his ropes every few miles); and the excessive chafing to which the container was subjected had a bad effect upon its life. This led to the introduction of the D shaped container. The bottom of this is made flat, and firmly anchored to the bottom of the superstructure with bolts or coach screws. The sides and ends are made horizontal for a height of about 3 ft. 6 in.; and this has proved effectual to prevent the deflated container dropping over the sides.

A very interesting development is the semi-rigid container. A box made of ½ in. boards and strengthened with wrought-iron brackets is fixed on the roof of the van. The length and width of this box depend upon the size of the van; but the height of the sides is usually not less than 3 ft. 6 in. The inside of the box is lined with canvas, and painted successive coats of thick oil paint and shellac; one coat being allowed to dry before the next coat is applied. This renders the box perfectly gas tight. The top is cut out of the rubber fabric, with a rise in the centre of from 12 in. to 18 in., and wide enough to allow it to slip over the outside edge of the box. It is then fastened with a continuous wooden lath and screws to the top outside edge of the box, and the joint given a couple of coats of shellac. The result is a perfectly rigid and gas-tight base and sides, with a flexible top, which presents an extremely neat and workmanlike appearance, even when the container is deflated.

A further development of the same idea is the rigid container. The box is made and lined as before, and strips of wood or wrought iron are bent the desired shape and fastened to the inside of the box, a distance of about 2 ft. apart. The canvas top is tightly stretched over the strips and fastened to the outside of the box, and over the canvas similar strips to those inside are fastened. The whole is then coated with shellac; the canvas being held rigidly between the inside and the outside strips. The great advantage of this type of container, apart from its neat appearance, is that the gas can be compressed within it. I have personally seen such a container charged up to a pressure of 15 lbs. per square inch. This means that if the container will hold 300 c.ft. at normal pressure, it will hold over 600 c.ft. at 15 lbs. pressure. I believe that if due consideration was given to the strength of materials employed, and to the method of bracing, a container such as described could be made to stand a pressure of 60 lbs. per square inch; and then the vehicle would run just four times as far as it would if the container was filled at normal pressure. A suggested improvement is that these containers should be made "torpedo" shaped in front, in order to offer less wind resistance.

A development on entirely different lines is the collapsible container. This is made like a "concertina," and is guided in its downward travel, as the gas is used up, by flexible stays running on rigid guide-rods fixed perpendicularly on the roof of the van; the guide-rods being braced at the top in order to ensure rigidity. The top of the container is weighted with a thin sheet of metal, and as the gas is used up, the container folds up and eventually lies quite flat.

Method of Filling Containers.

The method of filling these gas containers calls for some consideration. The flexible sleeve method is a very clumsy one, and far from safe. A much better way of dealing with the matter is a length of sheet iron piping perforated with ¼-in. holes and riveted to a 2-in. iron elbow. This is inserted inside the bag, and the flexible trunk is tightly bound round it. A length of 2-in. pipe is fitted to the elbow, and at the most convenient spot a 2-in by ½-in. tee is fitted to provide for the engine connection. Immediately below the tee a back-pressure valve is fitted, then a further length of pipe is screwed at the end with a 2-in. male gas thread. From the outlet of the tee, ½-in. iron pipe is run along the inside of the van, and a ½-in. plug cock fitted close to the driver's hand, continued with a length of flexible tube connected up to engine.

It is evident that if this system of propulsion is to become universal, gas undertakings must provide facilities for quick filling in every district. Further, the district for a radius of at least sixty miles should be organized, and a standard method of filling

agreed upon by all gas undertakings within this radius, in order that motors coming from a distance may know exactly where they can fill up, the hours during which the gas supply is available, the size of connections used, and the cost. With this object in view, the Manchester Gas Department have made the following proposals to various gas undertakings:

To instal special automatic coin operated meters in various places on the principal routes, the meters to be fitted with special full-way valves capable of passing 1620 c.ft. per hour at normal mains pressure.

The outlet of meters to be fitted with a 20-ft. length of flexible pipe with a union at the end, screwed for 2-in. pipe.

The meters to be fixed at garages or similar establishments on the main roads, and to be fixed free of charge to tenant. The tenant to be allowed a rebate of 10 p.ct. on the value of the gas passed through the meter as remuneration for rent or any trouble he is caused in connecting-up to vehicles, although it must be made clear that the responsibility for connecting-up rests with the driver.

Tokens may be purchased at the offices of the gas undertakings at a price to be agreed upon, each token operating every meter for 100 c.ft. of gas.

Arrangements to be made between the gas undertakings joining in the scheme to ensure tokens being returned to the issuing office.

A booklet to be issued giving the names and addresses of the establishments where the meters are fixed and the hours during which the premises are open.

The special attention of vehicle owners is to be drawn to the size of the union connection at the end of the flexible tube, and drivers warned that the inlet of their gas containers must be fitted with a thread to match the union.

It is hoped that if this method should prove a success, similar meters will be fixed in other counties; and there is no reason why it should not become the universal method of filling up throughout the country.

If there is one thing more than another that strikes a gas engineer, it is the crude methods employed in connecting-up the gas supply to the engine. If the best results are only just good enough—and I submit that should be the aim of all motorists—then I recommend the use of a specially designed coal-gas carburettor. [The author described in detail, with the aid of illustrations thrown on a screen, some coal-gas carburettors from which excellent results had been obtained.]

Relative Costs of Running.

No paper on this subject would be complete unless it dealt with the relative costs of running with coal gas as compared with petrol; and in order to obtain a basis for comparison, it is necessary to reduce the value of both fuels to British thermal units. I found that a gallon of petrol when carburetted with air, and the mixture consumed as a bunsen flame inside a Boys calorimeter, contains 145,000 B.Th.U. Therefore, 290 c.ft. of 500 B.Th.U. coal gas would have to be consumed to obtain a total of 145,000 B.Th.U. It will be seen, therefore, that, on the basis of an equal number of B.Th.U., 290 c.ft. of coal gas is equivalent to a gallon of petrol. On the other hand, it has been proved over and over again that 250 c.ft. of coal gas will run a motor vehicle just as far as a gallon of petrol; and in many cases this result has been obtained when the gas has been fed into the induction pipe in the crude manner I have previously described. When a special coal-gas carburettor is fitted, increased mileage is obtained; and in order to test this, a "Belsize" delivery van was placed at my disposal. I was assured by the owner that the average mileage, taken over a period of three months, was 18 miles per gallon. I had the van under observation for a week, and found that the average mileage, after a coal-gas carburettor had been fitted, was 19·2 miles per charge of 250 c.ft., without any alteration having been made to the engine beyond the fitting of the gas carburettor. It is rather difficult to reconcile this result with the number of B.Th.U. in each fuel; and the conclusion I am forced to is that coal gas is more efficient for power purposes than petrol. Even taking coal gas at its worst, and allowing that 300 c.ft. is equivalent to a gallon of petrol, and taking the price of gas at 4d. per 100 c.ft., (a fair average price throughout the country) and petrol at 4s. per gallon (which is, I understand, the price to-day), it will be seen an economy of 75 p.ct. is effected.

To summarize the advantages of this method of carrying coal gas at only a few inches water column above atmospheric pressure, some of the obvious advantages are as follows:

1.—The container can be easily and cheaply replenished with gas from any ordinary low-pressure main.
2.—It acts as its own pressure governor; thus obviating the necessity for any auxiliary governing accessories.
3.—There is no need for gas compressing machinery.
4.—The container is cheap to instal.
5.—It adds very little to the weight of the vehicle.

The practical disadvantages of this method are the fragile nature of the container and its bulky dimensions, although I think both these disadvantages are outweighed by the extreme simplicity of the arrangement, and the ease with which the container can be replenished.

It is admitted that storing gas in flexible containers is not an ideal method; but very much more could be done if manufacturers would co-operate with gas undertakings and turn out a much better quality of fabric. There seems to be need for a public body to draw up a specification of the material required, and to test each container before being fitted to the vehicles.

High-Pressure Storage.

To overcome the drawbacks of what might be called the low-pressure system of gas storage, much attention has been given to the question of compressing gas at high pressure in cylinders. It must be remembered that, although the compression of gas is a well understood business, an entirely new set of conditions arise when this method of storage is considered in relation to motor traction. In the first place, the weight and strength of the cylinder, the size of the cylinder, and the quantity of gas carried must be carefully considered. Apparatus for reducing the pressure to a few tenths above atmosphere must be designed; and the effect of compression upon the calorific value of coal gas must also be taken into consideration. Coal gas is being regularly compressed in this country to a pressure of 120 atmospheres (about 1800 lbs. per square inch); and this must be regarded as being the maximum pressure at which gas can be easily dealt with, although on the Continent pressures of over 3000 lbs. per square inch are quite common. Up to the present, the gas at these pressures has been compressed in steel cylinders. The great objections to steel cylinders are:

1.—The dead-weight of cylinders.
2.—The care and supervision required in dealing with cylinders stressed to this extent, and the liability of the metal to more rapid "fatigue," due to continual vibration; thus necessitating frequent annealing.
3.—The depreciation of the gas by subjection to such high pressure.

Dealing with the question of the weight of steel cylinders, the following is a list of standard size cylinders now on the market, together with the dimensions of the cylinders and the volume of free gas contained when compressed to the pressures specified:

—	Length. In.	Diam. In.	Cubical Capacity.	Weight. Lbs.	Press. Atm.	Vol. of Free Gas (C.ft.)
Gt. Western Railway	84	18	11·2	326	20	224
	99	14	10·37	—	20	207
	84	36	44·8	1668	20	896
Uxbridge Steel Barrel Co.	72	26	20·0	780	25	500
	72	20	12·0	480	25	300
	72	15	6·0	285	25	150
British Oxygen Co..	49	7	0·83	108	120	100

It is clear from the above that in adopting gas under pressure a considerable proportion of the carrying capacity of the vehicle would have to be sacrificed; and the wear and tear of tyres and other running parts would be increased per ton of goods carried. As to the liability of steel cylinders to fracture when subjected to high stresses and continual vibration, all metallurgists will agree that this "fatigue" rapidly takes place. The worst feature of it is that it cannot be seen, and must therefore be guarded against by annealing the cylinders at regular periods, whether they really require it or not. This, of course, adds very considerably to the expense; but it is a necessity in view of the great risks run by using a faulty cylinder.

As to the depreciation in the calorific value of gas, it must be understood that ordinary town's gas is not a "perfect" gas. Even compressed to a moderate pressure of only a few pounds per square inch above atmosphere, the "partial pressure" of the water the gas contains is not sufficient to keep the whole of it in a vaporous state. At 60° Fahr., the tension of aqueous vapour is 0·518 in. of mercury, which, with gas at standard atmospheric pressure, corresponds to the presence of 1·7 p.ct. of water vapour in the gas. If the pressure of the gas is raised to (say) 10 in. of mercury above atmosphere, the volume of the gas will change in the proportion of 4 to 3; so that when the gas regains its normal temperature of 60° Fahr., one-fourth of the water it originally contained in the form of water vapour will separate out in a liquid state—that is, supposing it was saturated with water vapour before compression. It is not until considerably higher pressures are obtained that the hydrocarbon bodies in the gas are appreciably affected; but, naturally, the precipitation of any of these detract from the calorific value of the gas. An interesting experiment in this direction was carried out a month or so ago, when a cylinder of gas compressed at 120 atmospheres was discharged through a reducing valve into a calorimeter, and frequent observations made of the heat developed. The effect of compression at 120 atmospheres (1800 lbs. per sq. in.) was to reduce the calorific value of the gas by about 10 p.ct.

I have already shown that water is precipitated, and that arrangements must be made in the manufacture of the cylinders to provide for this water to be drained off from time to time. Among other hydrocarbons precipitated by compression, naphthalene will be found; but observations go to show that there is always a sufficiency of liquid bodies to prevent this assuming a solid form. It is very probable, however, that the precipitations of hydrocarbons will, in time, assume a sticky mass; and it will then be necessary to arrange a method of "spraying" or "heating" the cylinders to allow this substance to be withdrawn.

It will be gathered, therefore, from my preceding remarks that I do not hold out any hopes of steel cylinders ever being universally adopted for the purpose of compressing coal gas for use on

motor vehicles. I believe the solution of the problem will be found in cylinders made of other metals than steel or composite rubber material. [Details were then given of the "Safe" gas cylinder made by the Murphy Submarine and Pipe Line Company. This was described and illustrated in the "Journal" for Aug. 14 last, p. 280.]

A cylinder built up of a composition of rubber and canvas and other materials has recently been made by the Wood-Milne Company, and passed the preliminary tests with very gratifying results. I am not able, at the moment, to go into details in regard to this cylinder; but I am in a position to say that a cylinder about 4 ft. 6 in. long by 1 ft. 3 in. diameter, and weighing about 60 lbs., will hold the equivalent of 2 gallons of petrol.

Another cylinder on entirely new lines is being made by Mr. Leo Swain. This consists of a thin liner of sheet steel around which is wrapped successive layers of rubber, linen, or other strong thread and canvas, or, alternatively, or in addition, layers of Chesterman's steel tape woven around with fabric. The ends consist of discs held together with metal rods which serve the double purpose of resisting axial and radial strain. The liner, after having been wrapped with the layers of material already referred to, is covered with rubber, and the whole vulcanized together. Mr. Swain hopes to be able to make this cylinder in a size to carry the equivalent of a gallon of petrol, and to weigh somewhere about 50 lbs. From the tests I have had with a small model, I believe he is on the right lines, and will succeed in his efforts.

Governors.

It must not be forgotten that if compressed gas is used for motor traction, it becomes necessary to introduce governing devices to reduce the pressure to slightly over atmospheric pressure. I must say at once that there is no automatic apparatus on the market which will reduce from (say) 500 lbs. per sq. in. to 1 in. water-column in one step. High-pressure governing valves are made by the James Keith and Blackman Company and the Bryan Donkin Company. It is admitted, however, that both these are too cumbersome for motor work. The alternative is to fit an automatic or hand-operated needle valve in the high-pressure outlet and discharge the compressed gas into an expansion chamber. The petrol tank will do very well for this purpose, and means must be provided to ensure that the pressure in the expansion tank does not rise above 2-10ths or 3-10ths pressure. An automatic cut-off valve must also be fitted, preferably to be operated by the accelerator pedal, to ensure the high-pressure cylinder being cut off when the engine slows-down in traffic or stops. Another alternative is to fit the carburettor with a variable jet and needle valve, so arranged that when the accelerator pedal is depressed, the needle is withdrawn from the jet, and when the pedal is released the jet is sealed. In any case, it may be taken for granted that mechanical difficulties of this kind will be overcome as soon as makers are ready with the cylinder.

Compressing Machinery.

One of the objections raised against the use of compressed gas is the necessity of installing compressing machinery. This is not a serious matter, as any internal combustion engine can be readily adopted for compression purposes. Apart from this, there are in Manchester at least half-a-dozen stations where gas may be compressed up to 3000 lbs. per square inch if desired; and I am in touch with a firm who already have many compression plants in operation in the district, and who are willing to enter into negotiations with manufacturers of cylinders to compress and distribute cylinders to any stock depôts throughout Lancashire, Yorkshire, and Cheshire. They have a scheme maturing in their minds whereby motor owners may join the associations at a fixed yearly subscription which will entitle them to pick-up charged cylinders in return for empty ones at certain fixed distributing depôts—the owner paying merely for the gas in addition to his annual subscription.

Some misconception seems to exist as to the space occupied by coal gas after compression. A gentleman I was speaking to a few weeks ago argued that, because the container would hold 100 c.ft. at a pressure of 2-in. water-column, it would necessarily hold 200 c.ft. if compressed to 4-in. water-column. This, of course, is wrong, as the initial pressure is one atmosphere *plus* 2-in. water-pressure. Therefore, an additional pressure of one atmosphere would be required to compress the gas to half its original bulk. The formula for working out the contents of cylinders under compression is as follows:

Radius squared × 3·1416 × length × pressure in atmospheres. One atmosphere, of course, equals 14·7 lbs. per sq. in. Therefore, the contents of a cylinder 4 ft. long × 2 ft. diameter, with contents compressed to 120 atmospheres, is 1507·96 c.ft.

DISCUSSION.

At the conclusion of the paper,

Mr. C. T. Needham, M.P., in proposing that their heartiest thanks be tendered to Mr. Barrett for his very instructive and excellent address, said the Executive of the Association were to be warmly congratulated on having been able to arrange for a lecture on coal-gas traction to be given. He believed it was the first to be delivered in Great Britain on this particular topic. When in Harrogate some time ago he saw Red Cross motors with gas-containers on the top, and on making inquiries he found they were running with entire satisfaction. It then occurred to him that possibly this would lead to a solution of the petrol difficulty. Whether this premise was correct or not depended, of course, upon the solution of the many difficulties which the lecturer had pointed out. He was glad to know that the gas undertakings throughout the country were assembling shortly to give one another the benefit of their experiences of coal gas for motor traction, and to try to reduce the whole matter to a uniform standard.

Mr. R. D. F. Paull (London) seconded the resolution, and said he considered Mr. Barrett had dealt with the subject in a very masterly manner indeed. At the annual general meeting of the Automobile Association in London last June, he ventured to suggest to their President, Mr. W. Joynson Hicks, M.P., that, instead of sitting down under the Petrol Restrictions Order, they should be "up and doing," and looking for something else to keep the wheels going round. He had the temerity to suggest coal gas. He was very glad that the early efforts in this direction were being energetically pushed now, and handled in the way the Manchester Association were doing. He was certain that the success of the demonstration in London last Wednesday, and the success of the lecture that night, would give a great impetus to this movement. He congraulated Alderman Kay and the Manchester Corporation Gas Committee on the excellent lead they had given to the gas undertakings of the country, and hoped the scheme they had set before other undertakings would be copied throughout the breadth of the land.

A Speaker from Wallasey complained that at Liverpool a charge of 1s. was made for the gas-works employee's time filling the container, even though only 100 or 200 c.ft. was supplied. The charge for the gas was a perfectly reasonable and legitimate one; but he suggested that garages should be supplied with meters, and that the 1s. charge should be abolished.

A Representative of the Liverpool Gas Company said they had been approached by several owners of motor garages, &c., as to what they proposed to do in this matter. Their difficulty was that they could not supply the meters for the garages. He was interested to hear that Mr. Barrett proposed to supply slot meters. The difficulty he (the speaker) understood was that it was almost impossible to obtain meters, or the materials with which to make them. If Mr. Barrett had any information as to where they could be obtained, he would be very glad to receive it. As to the charge of 1s. for the man's time, he thought this a perfectly reasonable charge. They could scarcely expect a man to stand at the different depôts for some prospective car which might never arrive. Again, it had occurred to them in Liverpool that the carriage of gas in the flexible container was very likely only to be a makeshift method, and might not continue. The lecturer had laid down other and new methods. This being so, was it to be expected the various gas undertakings throughout the country would undertake the capital outlay required for meters, &c., when this system of propelling motors might disappear very quickly? At Liverpool, they had offered every facility for anyone who asked for gas, providing he would supply the meter. They had also a duty to perform to their own consumers whose supplies were necessary, and should not be interrupted for the carrying-on of their businesses.

Mr. S. Meunier (Stockport) said it might clear the air if he told them something of the steps taken by the gas profession in regard to this matter. A special meeting of the Council of the Manchester District Institution of Engineers had been held that day, under the chairmanship of Mr. Walter Whatmough, of Heywood, and a Special Sub-Committee had been appointed to go into the whole matter, with the view to co-ordinating the arrangements for filling gas-containers in various parts of the country. The Council had, with the assistance of Mr. Barrett, gone very carefully into the Manchester scheme; and it was proposed to discuss the matter of filling stations and charges thoroughly at the next ordinary meeting of the Association, to be held at the end of the month. It was intended that the British Commercial Gas Association should be invited to co-operate in the matter, so that they might collate all the necessary information as to where the various filling stations should be placed in different districts, to avoid the overlapping of capital expenditure and enable owners of motor conveyances to have their containers re-charged whenever needed.

M. Leo Swain said that if the Manchester, Liverpool, and Counties Commercial Motor Users' Association could be of any use to the Manchester District Institution of Gas Engineers in this matter they would be only too willing to give all the information in their possession to the Council.

Mr. Meunier replied that it was the intention of the Council to ask the British Commercial Gas Association to communicate with the Motor Users' Association on the subject.

Mr. Christian (Southport) apologized for the unavoidable absence of Mr. John Bond, the Gas Engineer, who was prevented from attending owing to important Government work. They were very deeply interested in the coal gas for motor traction question at Southport, and during the past summer had had a very busy time. They were, however, quite ready to supply motor conveyances with gas, and would welcome the opportunity of doing so. They had supplied the motor buses running between Southport and Blackpool with gas throughout the summer, and had found that they could load an 800-ft. container within a period of five to six minutes. With regard to the difficulty of meters mentioned by the Liverpool speaker, what they did at Southport in the case of garages was to ask whether they would undertake the expense of laying a pipe from the main to the meter, and they lent them the meter. Personally, he should like to put out a thousand meters to-morrow if they could get them.

The Chairman said he was sure the meeting had heard with pleasure the remarks of the speakers who represented the gas profession, and invited the comments of motor users regarding the containers.

Mr. Shrapnell-Smith suggested that the fabric question should be gone into with the view of "getting a fabric better in gas retaining qualities." With regard to the question of charges for supplies of gas to large consumers, he understood that if the London General Omnibus Company ran their motor fleet on coal gas the extra day-load of the Gas Light and Coke Company would amount to something like 28 million c.ft. of gas per week. The Gas Company had said they could not take this load under war conditions. He should like to point out to them that if they did not take the load they would find that the large omnibus and carrying companies would lay down their own gas-works. He believed no powers were required to do this, as they did not propose to sell to the public. This, of course, was merely *en passant*; but he desired to say

that the question of coal gas for motor traction was going to be a very big thing. The more he looked into the subject, the more he was convinced that this was going to be a demand that would last after the war. It was not merely a passing demand. The gas-bag in its present state would possibly pass away. But those connected with the gas industry of this country would find that they had secured a permanent new customer; and it would pay them handsomely to go thoroughly into the whole question. War conditions might hinder them at the present moment; but these would pass. He would do all in his power to strengthen the amicable relations which had hitherto existed between gas undertakings and motor vehicle owners. Alluding to the tax of 3d. per gallon on petrol, he said that nothing was going to be done in the way of taxing gas—at any rate, until the war was over. Gas engineers, therefore, had a free run for coal gas; and Mr. Walter Long could be relied upon to resist any attempt that might be made to confine this new development.

Alderman Kay (Manchester) said it gave him much pleasure to support the resolution of thanks to Mr. Barrett. He expressed his thanks to the Commercial Motor Users Association for having invited his colleagues and himself to the proceedings. It was remarkable how history repeated itself. In 1825, a Company was established in London called the Provincial Portable Gas Company; and they supplied gas in vessels to people to burn in their own houses [see p. 135]. With regard to the question of meter shortage, they had experienced no difficulty in this direction at Manchester. He thought that the difficulty mentioned by the Liverpool representative could be got over, as at Blackpool, where gas-filling points were established at the gas-works entrance. The motors drew up in the street, and connected their bags to the pipes against the buildings. The filling-pipes were all at gas-holder pressure to facilitate quick filling. One filling-point was supplied through a 200-lt. meter for testing the capacity of a bag the first time it was filled. Afterwards, they were filled without registering.

Mr. Barrett briefly returned thanks to the various speakers for the kind way they had received his communication; and the proceedings terminated.

THE CHEMISTRY OF COAL.

Further French Investigations.

Recent papers and discussions on the chemical constitution of coal, at the Société Technique du Gaz, as represented by the addresses of MM. Rouland and Versepuy ["Journal" Sept. 4, p. 415], have included also a lengthy communication by Prof. A. Mailhe, which it is possible to pass into our pages only in an abridged form, in respect to more recondite chemical speculations and with omission of certain portions which deal with items already treated in the papers by MM. Rouland and Versepuy just mentioned.

In drawing an analogy between cellulose and coal, M. Mailhe pointed out how little was known of the chemical constitution of the former, beyond the fact that it was a substance of alcoholic character. How much more difficult was the problem of investigating the chemical constitution of a body which could not be said to exist in a pure state? The problem before gas chemists was the discovery and identification of substances which, by their existence in coal, could throw light upon its chemical constitution. In regard to the treatment of coal with solvents at a moderate temperature to this end, M. Mailhe drew a distinction between those which are neutral and those which exert their solvent action by virtue of entering into combination with substances in the coal. To the former class belong alcohol, ether, chloroform, carbon bisulphide, benzene, and nitrobenzene. These, as a rule, extract only a small proportion of the coal in a soluble form. The chemical solvents are further subdivided into substances of acid character, such as phenol, and basic bodies, among which are soda (in alcoholic solution), aniline, pyridine, and quinoline. As the work of different investigators has shown, the poportion of coal taken into solution by solvents of this class is much greater as a rule.

In respect to neutral solvents, M. Mailhe instanced 0·0167 p.ct. of extract obtained by Vignon with boiling alcohol; 0·059 p.ct. with ether (also by Vignon), and 0·3 p.ct. and 1·25 p.ct. obtained by Muck with ether from a Westphalian and gas coal respectively. Carbon bisulphide has yielded an extract, not definitely investigated. With nitrobenzene at boiling point, Vignon has removed 3·19 p.ct. of the weight of the coal. The recent results on the large scale by Pictet, Ramseyer, and Kayser—already recorded in the "Journal" for Dec. 26, 1916, p. 645—were summarized by M. Mailhe.

Among experiments by means of chemical solvents, those of Parr and Hadley (1915), with phenol at 110° C. in a current of carbonic acid, showed a loss by extraction of 20 to 30 p.ct. with some coals, and of 35 to 40 p.ct. with others. In these tests it was found that the residue was non-coking; the extracted material appeared to be that conferring the coking property. The extract was found to be rich in volatile substances (not examined); while distillation of both extract and residue yielded gases of similar composition, but with a predominance of hydrogen in the former and of methane in the latter. Hart's extraction of a brown ore with alcoholic solutions of soda prompted his conclusion that the greater or less coking in the heat which a coal undergoes is in proportion to its content of this substance.

Of the organic basic solvents, the experiments of Bedson, in 1899 and 1908, have shown that 22 to 38 p.ct. of solid extract is obtained by the action of hot pyridine on finely powdered coal. Baker & Anderson and Henderson (1902) obtained 20 p.ct. by the same means; and Vignon, in 1914, from a gas coal with boiling pyridine, 17·3 p.ct. With aniline at its boiling temperature, Vignon has extracted percentages ranging from 1·56 to 23·4 with various coals—the differences serving as a basis for their classification as coking, semi-coking, and non-coking.

The literature of the action of solvents upon coal has, as its most recent addition, a very complete bibliography of the subject by M. Wahl in a paper before the French Chemical Society. In his own researches, published in 1912, M. Wahl has shown that the extracts obtained by the action of pyridine on coal vary in quantity according to the nature of the latter—that they may be as much as 24 p.ct., and that the extract is practically of the same composition as the original coal, any difference which exists being in respect to the hydrogen. In the case of a Lens coal, yielding only 0·44 p.ct. of extract to pyridine, quinoline yielded 1·99 p.ct. at 120° C. and 5·56 p.ct. at its boiling point—that is, four times that with pyridine. Extraction of a coal with quinoline, made by M. Vignon in 1914, yielded 47·3 p.ct.

It is unnecessary to follow M. Mailhe in his review of recent research by way of the distillation of coal at a reduced temperature in a partial vacuum, since the work in this field of Burgess, Wheeler, and Jones, and of Pictet and Bouvier has been fully noticed in the "Journal"—for Dec. 26, 1916, p. 647, in the case of the former, and for May 1 last, p. 192, in the case of the latter. M. Mailhe points to the different results obtained by these two groups of investigators, and at the same time notes that the hydrocarbons in Pictet's exhaust tar are of the same nature as those occurring in benzene extracts, as also in those with acids and bases. It would thus seem that these hydrocarbons resist destructive distillation under reduced pressure. Pictet, on the basis of these results, has put forward the hypothesis that coal consists of a solid hydrocarbon impregnated with a liquid chemically closely allied to petroleum. The suggestion is strongly supported by experimental evidence; but, whatever be its value, it is worthy of special note that Pictet's work represents the first extraction from coal of hydrocarbons of definite composition, completely different from those obtained by destructive distillation.

It is also noteworthy, as pointed out by both M. Mailhe and M. Versepuy, that there should be the great difference between the quantity of tar (4 p.ct.) produced by exhaust distillation and the quantity of extract (0·25 p.ct.) yielded to benzene, in view of the fact that all the hydrocarbons obtained by M. Pictet by exhaust distillation are soluble in benzol. If the coal were simply impregnated with these latter, it might be thought that four days' extraction with benzene would remove them. Hence it would seem that these hydrocarbons exist in the coal in the form of more or less stable compounds, and that, apart from the solvent action of the benzene, another factor—that of temperature—plays a part in their liberation. If this be the case, extraction with benzene at a higher temperature should result in a greater proportion of soluble extract. Rau's experiments in 1910, according to which coal extracted at 200° C. under fourteen atmospheres yielded 1·5 p.ct. extract, are in line with this view, and further confirmation is gained by those of Fischer and Glund, in which coals were treated with benzene in a bomb at temperatures up to 235° C. (equivalent to forty to fifty atmospheres) and yielded 6·6 p.ct. extract—about half of it solid. At the same time our knowledge of the nature of these extracts, particularly those which are liquid, is exceedingly small. To instance, again, the action of a neutral solvent, Vignon, with nitrobenzene at the ordinary temperature, obtained 1·41 p.ct. of extract and 3·19 p.ct. with the solvent at its boiling temperature of 208° C.

It is in the use of acid or basic solvents that the portion removed from the coal greatly exceeds that with benzene extraction or exhaust distillation. With pyridine at its boiling temperature of 117° C., Wahl's percentage of extract was 24; Bedson's 38. Aniline, boiling at 183° C., has removed 23·4 p.ct. of its material from gas coal and quinoline, boiling at 238° C., 47·3 p.ct. With phenol at 100° C., in a carbon dioxide atmosphere, the extract has varied from 20 to 40 p.ct. The difference between the action of these "chemical" solvents and that of neutral substances or of exhaust distillation becomes still more striking when regard is paid to the respective temperatures. At 117° C., pyridine extracts from 95 to 150 times as much as benzol. With aniline at 183° C., the ratio is 95 times; with quinoline at 238° C., 185 times. At 238° C.. certainly there may be slight decomposition of the coal. But in no case should there be any at 117° C., still less at 100° C., at which temperature phenol yields 20 to 40 p.ct. of soluble extract. Hence it is reasonable to assume that the chemical solvents react, as bases or acids, on certain compounds of low stability which exist in coal, entering into at any rate partial combination with them to form products of a different chemical character. The exhaustive study of the extracts obtained with various active solvents should throw fresh light upon the constituents of coal and on the chemistry of coking.

The investigation of coal in many other directions than those followed by Pictet and his students is, however, called for. Already in Germany use has been made in the treatment of coal of the formation of ozonides developed by Harries during the last few years. In 1916, Fisher and Glund, by treating powdered coal suspended in water with a current of ozone, found that the substance gradually disappeared—leaving a brown solution, resembling caramel, and of strong acid reaction. This operation suggests the formation of ozonides and the presence in coal of bodies of the ethylene type; these latter, according to Harries, yielding ozonides with ozone, subsequently passing into aldehyde bodies. Details of these changes are lacking.

THE SCHEME OF FUEL RESEARCH.

The Lines of the Scheme and the Establishment of a Fuel Research Station.

The Fuel Research Board (of which Sir George Beilby, F.R.S., is Director, and the Hon. Sir Charles A. Parsons, K.C.B., F.R.S., Sir Richard Redmayne, K.C.B., and Sir Richard Threlfall, K.B.E., F.R.S., members, with Professor W. A. Bone, F.R.S., Consultant to the Board) have presented to the Committee of the Privy Council for Scientific and Industrial Research the following report on their scheme of research and on the establishment of a fuel research station:

Interdependent Lines of Research.

In their first report [not published] the Board stated that they had in view two main lines of research: First, a survey and classification of the coal seams in the various mining districts by means of chemical and physical tests in the laboratory; and, second, an investigation of the practical problems which must be solved if any large proportion of the raw coal at present burned in its natural state is to be replaced by various forms of fuel obtainable from coal by carbonization and gasification processes.

When the previous report was written, it was believed that the survey and classification of coal seams might be proceeded with in advance of the second line of inquiry; but further consideration has shown that from the practical point of view the two lines are so thoroughly interdependent that they can be most satisfactorily dealt with side by side. This view will be further developed after the position and prospects with regard to the second line of inquiry have been more fully explained.

In preparation for the organization of the first line, however, an experimental study of standard methods for the examination of samples of coal in the laboratory has been made. Hitherto in the systematic examination of coals in the laboratory, there has been no generally accepted low-temperature carbonization test. In the survey and classification of coals for the purposes of the present inquiries, a test of this kind is practically indispensable. Certain existing tests are designed to ascertain the suitability of coal for gas or coke making; but as both these methods of carbonization are carried out at temperatures above 900° C., they give little or no direct information as to the behaviour of the coal when carbonized at 500° to 600° C.

As a result of experimental work carried out for the Board in the Fuel Laboratory of the Imperial College of Science and Technology, a test has now been elaborated which, by direct weighing and measurement, gives the yields of gas, oil, water, and carbonaceous residue which result from carbonization at any definite temperature. The apparatus is simple, and is so arranged that the progress of the distillation can be watched from start to finish. The products can be weighed or measured with reasonable accuracy, and any or all of them can, if desired, be submitted to further examination. The method has been tested on certain typical coals and at a variety of temperatures; but, before publishing the results, it is proposed to make further tests with a wider range of samples. At the same time, steps will be taken to standardize the apparatus and to arrange for its regular production for laboratory use.

With regard to the organization which will ultimately be required in the principal coal mining districts for the collection and registration of samples, the Board are glad to say that they have found every disposition on the part of the representatives of the coal owners to co-operate in this work. It is not proposed to start any extensive organization for this purpose till the preparations for the second line of inquiry are further advanced. The accumulation of large numbers of samples would serve no useful purpose at present, and would be decidedly inconvenient. It is certain that as soon as the arrangements for the examination and testing of samples are in working order, it will be an easy matter to maintain the necessary supply of samples to keep the laboratories and the Research Station fully occupied.

Products and Coal Distillation.

In the first report the following statement with regard to the second line of inquiry was made:

> The second of the proposed lines of inquiry has been led up to by a variety of influences during the past eight or ten years. Among these influences have been the demand for cheaper and more ample supplies of electrical energy, for home supplies of fuel oil for the Navy, of motor spirit for the Transport and Air Services, and last, though by no means least, for smokeless domestic fuel. This last has been brought about through the growth of public and municipal opinion on the subject of smoke prevention in cities and in industrial centres.
>
> The only development which would satisfy all these needs simultaneously would be the replacement of a large proportion of the raw coal which is at present burned in boilers, furnaces, and domestic fires, by manufactured fuels prepared from raw coal by submitting it to distillation.
>
> The greater part of the coal which is consumed in Great Britain is burned in its natural state as it comes from the mines. The question of the moment then is: To what extent can and ought the present use of raw coal to be replaced by the use of one or other of the various forms of fuel manufactured from coal—coke, briquettes, tar, oil, or gas. While there is already in the possession of experts a certain amount of knowledge and experience which might enable them to organize and direct schemes for the replacement of raw coal by manufactured fuel in particular directions and on a fairly large scale, no really comprehensive scheme can be formulated till certain perfectly definite problems in coal distillation have been solved.
>
> These problems can only be solved by carefully organized experiments on a working scale carried out under the conditions likely to arise in practice.

The gas-retort and the coke-oven have become highly developed appliances for the carbonization of coal at temperatures ranging from 900° to 1200° C. In the former, the primary object of the carbonization is to obtain the maximum yield of gas suitable for domestic and industrial lighting and heating; while in the latter coke is regarded as the principal product. In both cases, the bye-products of the operation are of economic value, but are necessarily of secondary importance. In considering the broad question of the replacement of any considerable proportion of the coal which is at present being burned in its raw or natural state by manufactured forms of fuel, the part which may be played by high-temperature methods of carbonization will need to be taken into account. For this purpose, a great amount of experience is available; and trustworthy data on which to base the calculation of the economic possibilities are in existence.

The distillation of oil shales at low temperatures for the production of mineral oils, paraffin wax, and ammonia is a highly developed industry; but the oil shales are totally unlike coal in their nature and in the products which they yield, so that the experience gained in this industry, though undoubtedly valuable, is only indirectly useful so far as coal is concerned.

As regards the carbonization of coal at low temperatures, there is no corresponding body of experience in existence; and there are very few properly accredited data available. Some work has been done by individual inventors and syndicates; and a certain amount of experience has been gained. While only portions of this experience have been disclosed, enough is known to justify the conclusion that much still remains to be done in devising the special forms of apparatus required for the economical carrying out of this type of carbonization.

The way is clearly open for a serious attempt to determine whether an economical and efficient apparatus can be devised for the carbonization of coal at low temperatures, and whether, by the use of such an apparatus for the carbonization of properly selected coals, products will be obtained of a collective value greater than that of the original coal, *plus* the cost of carbonization and handling. Obviously, the evolution of an economical and efficient apparatus is at the root of the whole matter; for only after a thoroughly practical apparatus is available can trustworthy tests of the various classes of coal be made, and the economic possibilities of the method be fully weighed and considered.

Questions to be Attacked.

The solution of these fundamental problems will supply a new base from which to attack questions like the following:

1.—Can the 35 to 40 million tons of raw coal which is used every year for domestic heating be wholly or partially replaced by smokeless fuel, solid and gaseous, prepared by the carbonization of this coal?
2.—Can adequate supplies of fuel oil for the navy be obtained by carbonization of the coal which is at present used in its raw form for industrial and domestic purposes?
3.—Can supplies of town gas be obtained more economically and conveniently by methods of carbonization and gasification other than those at present in use in gas-works?
4.—Can electric power be obtained more cheaply if the coal used for steam raising is first subjected to processes of carbonization and gasification?
5.—Will the more scientific development of the preparation and use of fuel, which would be implied in the successful working out of the foregoing questions, enable the peat deposits of the United Kingdom to take a serious place as economic sources of fuel for industrial purposes?
6.—Can the use of gaseous fuel in industrial operations be forwarded by the development of more scientific methods of combustion in furnaces, muffles, and ovens used in metallurgical, ceramic, and chemical operations?

The answers to these questions will only be obtained by co-ordinated research carried out on the lines of a broad and well-considered scheme. The subjects to be dealt with are already attracting the attention of serious workers in the industries; and it is to be expected that solutions of some of the problems will be supplied by these workers. The Board sincerely hope that this will be the case. They would regard it as a great misfortune if the establishment of a Government organization for Fuel Research were to result in the discouragement or limitation in any way of the activities of outside workers or organizations. They venture to hope, rather, that many of these workers will be disposed to welcome a national scheme of research, the aims of which are broad and yet definite, and in which the more specialized contributions from all sides will naturally take their place.

Economic Considerations.

In considering new and extensive schemes of carbonization, it is necessary to bear in mind that outlets for all the products of carbonization must be found. The gas, coke, and shale oil industries are all of old standing, and each has had to develop outlets for its products by patient and continuous effort. No new carbonization scheme can be justified economically, if it can

only live by poaching on the preserves of the existing industries. Even if an efficient method of low-temperature carbonization is evolved, it will be valueless in the wider sense unless profitable outlets for all the important products can be developed. It is obvious that the Fuel Research Board, which is in official touch with the Admiralty, the Ministry of Munitions, the Board of Trade, and other public departments, is exceptionally placed for the furtherance of schemes which involve the finding of large outlets for products new and old. It is known, for instance, that the Admiralty attach great importance to the development of supplies of fuel oil from home sources, so that it may be taken for granted that this requirement alone would absorb all the oil which could be produced by the carbonization of tens of millions of tons of coal per annum. This fact alone gives an entirely new aspect to the extension of carbonization in hitherto untried directions. But while it will undoubtedly help on the economic side of the problem, it in no way relieves the pressure on the technical side. In a way, moreover, it accentuates the problem now to be referred to—the profitable disposal of the coke or carbonaceous residue left when the volatile products are distilled from the coal. The percentage of coke obtained varies with the quality of the coal and the temperature at which it is carbonized; but it may be taken on the average that each ton of coal carbonized will give about 15 cwt. of coke. Thus, to obtain 1 million tons of fuel oil for the navy, it would be necessary to carbonize 20 million tons of coal, and the coke produced would amount to 15 million tons.

The disposal of this very large quantity of coke or char at a profitable price must be regarded as the vital question, if low-temperature carbonization is to be established on a sound economic basis. The research scheme must therefore include a very complete inquiry on three main lines:

1.—The use and value of this coke for the direct firing of steam-boilers.
2.—Its gasification in producers for the manufacture of low-grade fuel gas and the recovery of its nitrogen as ammonia.
3.—Its use for industrial and domestic heating either directly, as it comes from the retorts, or after its conversion into briquettes.

The second of these inquiries will involve the development of a special form of gas-producer and auxiliary plant, if the best results are to be obtained from the coke. It will also involve the development of a system of boiler firing in which fuel gas of 130 B.Th.U. can be burned at least as efficiently as coal, both as regards thermal efficiency and the effective evaporation per square foot of heating surface.

In all that concerns the preparation and use of special forms of fuel, there are two distinct stages of development to be successfully passed. In the first stage, apparatus and methods have to be evolved and tested till a practical standard of efficiency is reached. In the second stage, the consumers of fuel must be induced to study the new apparatus and methods till they thoroughly understand, and in the end adopt, them. This second stage will be most readily passed, if an expert staff trained at a fuel research station is available to undertake the education of those who desire to adopt the new methods and appliances.

The use of town gas as a fuel for industrial purposes has made great strides during the past few years; and a number of experts are to-day engaged on the design and adaptation of furnaces and apparatus for these purposes. The actual practice of gas heating still lags a long way behind the ideals of economy and efficiency; and there is room for much useful experimental inquiry into principles and methods.

The use of the lower grades of fuel gas, though successfully carried out in certain directions, is very imperfectly understood in the majority of industries in which gas might be used for heating and power purposes. In this direction, there is scope for much useful work both in research and in the education of experts and consumers.

Electrical Ideals and Plausible Statements.

A single illustration may be given of the complicated inquiries which will have to be conducted before an answer can be given to what seems to be a simple question.

There is a very general belief among electrical experts that the future of British industry will be greatly affected by the cost at which power in bulk can be supplied in the form of electricity. It has been proposed, for instance, that large electro-chemical works should be established in this country for the manufacture of products which in the past have been manufactured in parts of the world where cheap water power is available. In this connection, it has been suggested that the cost of producing power from coal in this country would be substantially reduced if, instead of burning the coal directly under the steam-boilers, it were first subjected to carbonization and gasification processes which in addition to fuel gas would yield valuable bye-products. Plausible statements have been issued showing the enormous savings or profits which would accrue if schemes of this sort were adopted. Unfortunately, these estimates have generally been made on a very slender foundation of knowledge and experience. On the other hand, those who by experience and practice are best qualified to judge, hesitate to prophesy as to what the economic result of a combined carbonization and power generating scheme would be; but they agree that the interests at stake are so great that the question ought to be authoritatively answered once for all.

But no answer can be accepted which is not founded on the complete working-out of the scheme—no important step in the series of operations being omitted or slurred over. This series of operations will start from the mechanical preparation of the coal and its conversion into solid, liquid, and gaseous products by carbonization. It will end with the delivery of a known weight of high-pressure steam under the conditions most favourable for power production by turbo-generators. In the proposed scheme of research, it will be seen that the investigation of each of the steps involved in the above inquiry is provided for. Three, at least, of these steps involve pioneering work on an industrial scale; and the work may occupy a considerable time. The Board realize that it is possible that the net result of this particular inquiry may be to show that, purely as a means of cheapening the cost of electric power, the use of carbonization methods has not much to commend it; but that certain incidental advantages will justify its use in particular cases.

The Fuel Research Station.

The scheme of research which has been outlined in this report can only be efficiently carried out in a fuel research station designed and equipped for the purpose, in which operations on an industrial scale can be carried out under proper working conditions. The following is a description of the equipment which will be required for the research work at present in view:

A Railway Siding will pass through or alongside of the station, and the coal to be used in tests will be received in railway wagons at

An Unloading Platform provided with a sampling-floor, a coal breaker and screens, a weighing-machine, an elevator, and high-level bunkers from which the coal will be passed on to

The Retort-House. In this house ample space will be provided for the erection of the various forms of carbonizing apparatus which are under investigation. Facilities will be provided for quickly carrying out the necessary changes and improvements in the apparatus as the experimental work proceeds. The hot gases will be led from the retort-house into

The Condenser and Exhauster House, which will be equipped with condensers, washers, scrubbers, exhausters, compressors, meters, pressure regulators, gauges, pumps, motors, and tanks.

For the collection and examination of the gases in bulk Gasholders will be provided.

The hot coke from the retort-house will be elevated to High-level Bunkers, from which it can be supplied to gas-producers, steam-boilers, briquetting plant, or to railway wagons.

The Gas-Producer House will be provided with one or more gas-producers, with heat exchangers, washers, scrubbers, and liquor tanks.

The Steam-Boiler House will be provided with one or more water-tube boilers of modern type, and with feed-water tanks, water and steam meters, pumps, &c.

The Briquetting House will be provided with grinding, mixing, and briquetting machines.

Tar and Oil Stills and Condensers will be provided for dealing with the liquid products.

The Gas-Furnace House will be equipped for the testing of gas muffles, annealing ovens, and melting furnaces.

Laboratories, Offices, and Workshops suitably equipped will also be necessary.

As regards the location of this station, the desiderata are: That it should be within easy reach of London, that there should be ample railway and other facilities for the transport of coal from all parts of the kingdom, that there should be ready means for the disposal of the large quantities of coke, oil, and gas which would be produced in the regular course of experimental work, and that a supply of labour, skilled and unskilled, should be available.

It was realized that these conditions could only be fulfilled by a site in the neighbourhood of a large gas-works; and some months ago the Director of Fuel Research approached Mr. Charles Carpenter, D.Sc., on the subject. Mr. Carpenter is Chairman of the South Metropolitan Gas Company, and he is a member of the Carbonization Sub-Committee of the Coal Conservation Sub-Committee of the Reconstruction Committee, of which the Director is Vice-Chairman. Following this conference, Mr. Carpenter, on behalf of the Board of the South Metropolitan Gas Company, made the following very generous offer to this Board:

(1) To lease to the Government at a peppercorn rent sufficient land at the East Greenwich Gas-Works for the erection of a research station.
(2) To prepare drawings and specifications for this station on lines to be laid down by this Board, and to make contracts for its erection.
(3) To give every facility for the transport of coal and other supplies to the station, and to take over at market prices the surplus products, gas, tar, liquor, and coke resulting from the operations at the station.

After further conferences, a suitable site was agreed upon. The

proposed site is a strip of level ground about 250 ft. wide by 700 to 800 ft. long situated on the main siding which connects the gas-works with the South-Eastern Railway, and with access to an existing road.

The foregoing scheme of research is obviously not intended to cover the whole of the territory which is open for exploration to-day. Still less ought it to be regarded as setting any limits to the exploration of new territories in the future. The root idea of the scheme is that certain fundamental changes in the preparation and use of fuel which have been proposed are of such far-reaching importance that the solution of the technical and economic problems involved ought to take precedence of all other matters. This does not mean that other lines of research will be ignored, but only that the larger issues must be kept well to the front till definite solutions of those technical and economic problems can be given. Though no direct reference has been made to the preparation and use of fuels from oil shales, brown coals, and peat, it is obvious that experimental inquiries on these matters will naturally find a place in the developments of the present scheme.

The research station, as planned, will be capable of any extensions which will be required for future researches. Out of the four acres which it is proposed to lease for the station, only one acre will be occupied by buildings under the present scheme. Further, a large part of the equipment of these buildings will be of a permanent character, and will serve all the general purposes of a research station. Future extensions will, therefore, not repeat this permanent equipment, but will be based upon it.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Sliding-Scale Injustice.

SIR,—The text of this letter is provided in last week's correspondence column (p. 81): "Only it does not follow that there is necessarily any fictitious character in the application of theoretical principles because some companies have large margins and others small margins between the selling price and the standard price."

The character of the sliding-scale, I suggest, not only lends itself to the application of fictitious principles, but asks for them.

Take, for example, the attempt of the industry to temporarily adjust accretions to dividends on an equitable basis. The theoretical principle of treating "all alike" is there; but fictitious application is also there.

EXAMPLE.—£100 (*Nominal*) 5% *Share Capital with Half-Crown Slide.*

—	Existing Dividend. 2s. 6d. per Penny Penalty.	Dividend Adjusted. 6d per Penny Penalty.
Pre-war Margin of Threepence . .	£ s. d. **5 7 6**	£ s. d. **5 7 6**
	s. d.	
Price of gas reduced below standard by.	0 2	£ s. d. 5 5 0	£ s. d. 5 7 0
" " " " " . .	0 1	5 2 6	5 6 6
Standard	. .	**5 0 0**	5 6 0
	s. d.	
Price increased above pre-war price by.	0 3	4 17 6	5 5 6
" " " " " "	0 4	4 15 0	5 5 0
" " " " " "	0 5	4 12 6	5 4 6
" " " " " "	0 6	4 10 0	5 4 0
" " " " " "	0 7	4 7 6	5 3 6
" " " " " "	0 8	4 5 0	5 3 0
" " " " " "	0 9	4 2 6	5 2 6
" " " " " "	0 10	4 0 0	5 2 0
" " " " " "	0 11	3 17 6	5 1 6
" " " " " "	1 0	3 15 0	5 1 6
" " " " " "	1 1	3 12 6	5 0 0
" " " " " "	1 2	3 10 0	5 0 0

The orthodox slide is 2s. 6d., and the proposed adjustment 20 p.ct., or one in five—with two *accidental* factors:

(*a*) Date company placed under sliding-scale; and
(*b*) Date war declared.

The effect is different in every application. The rays of Opportunity's smile are enjoyed by some more than others—according to the margin between pre-war selling price and standard price; and, after all, it is but the *accretion* to standard which is being adjusted, and not *gas profits*. *Ergo*, if there be no accretion, there can be no adjustment.

Given the opportunity, at least one company would have had a pre-war price reduction. Threepence reduction would have sufficed not only to make the standard dividend secure, but might also have entitled the shareholders to accretions during the past three years—surely, a case for moral damages!

The other point is that in equivalent effect upon dividend a 5d. per 1000 c.ft. increase in war price represents a pre-war increase of only 1d., and emphasizes divergence in the ratio of benefit.

In defending the "Liberties of the Poor" against the "Powers of the Rich," the pound of flesh impeachment was made by the "enemy," but a veil had better be drawn over the misconception.

Many apologies for encroaching upon your valuable space.

Liverpool, Oct. 12, 1917. EDWIN UPTON.

Mr. Ionides and the "Captive-Fire" Lights.

SIR,—Let me thank Mr. Ionides for his letter. I presume he has further consulted the source of the information which he unfortunately misstated in the paper he read before the Institute of Metals. As he now points out, he took Curve C instead of Curve D; and I am pleased to see he stands to be corrected to the extent of 10 candles per cubic foot—a matter of 45 p.ct.

With regard to the other matters alluded to in his letter. If Mr. Ionides is content to compare his burner and all its accessory apparatus, with simple self-contained non-mechanical lamps that can be screwed to any ordinary gas supply, he will, I fear, find few to agree with him.

J. G. CLARK.

Laboratory, Horseferry Road, Oct. 11, 1917.

SIR,—We, as the proprietors of the original British patents for the Selas system, and of Turner's patents for apparatus for maintaining any predetermined mixture of gas and air at a constant pressure, and for patent burners and appliances for use therewith, trust you will give us the opportunity of taking exception to the statement by Mr. Alex. C. Ionides, jun., that the "Captive Fire" system of lighting is at least superior in candle power, at the same pressure, to any known system, as published in your issue of the 9th inst., in Mr. Ionides' reply to Mr. Clark's letter of the 27th ult.

Our apparatus gives equal efficiency at a pressure of 1-in. water column, as with higher pressures. However, in lighting installations, we usually operate at a pressure of 10-in. water column. One of the advantages secured thereby is that the existing low-pressure gas-pipe services in any works can be utilized for the system.

There are over a thousand installations in use in Great Britain for heat treatment and lighting, which proves that, as far as we are concerned, there is nothing of an experimental nature about the application of the pre-mixed system to industrial requirements.

Manchester, Oct. 12, 1917. SELAS-TURNER CO., LTD.

The National Gas Council and Local Government Authorities.

SIR,—At a meeting of representatives of the gas industry held this week, it was noticeable that works owned by local government authorities were practically unrepresented, or, to be more exact, that their financial difficulties had not been put forward or were of secondary importance to those of gas companies.

Looking at the constitution of the National Gas Council, one could not expect it to be otherwise. The Council is composed of representatives of the Gas Companies' Protection Association, the Society of British Gas Industries, the British Commercial Gas Association, and the Institution of Gas Engineers. None of these Associations directly represents concerns owned by local authorities; and, if the interests of such concerns are to receive adequate consideration, they should be represented in the same manner as the companies are through their Protection Association. I do not suggest the formation of another Association (there are more than enough already); but representatives of local authority concerns might organize themselves as sub-sections of the existing District Commercial Associations, and these sub-sections could secure direct representation upon the National Gas Council.

Could not the National Council co-opt an official of the Local Government Board? It would be a short-cut for keeping the Board in touch with the large capital it controls in the industry, and the industry in touch with a Government Department.

J. MOGFORD, Engineer and Manager,
Briton Ferry Urban District Council Gas-Works.

Briton Ferry, Oct. 13, 1917.

Horley District Gas Company.

SIR,—With regard to the report of the above Company's meeting in your issue of the 25th ult., when the Chairman suggested that no proxies would be sent out by the Directors, I at once rose and stated that the Directors could not possibly agree to any such proposal; and one of the shareholders present (Mr. Broadberry) assented to this view. The meeting was left in no doubt that proxies would be sent out in the usual way.

J. W. STEVENS.

Horley, Oct. 6, 1917.

West of England Street Lighting Defects.—Many complaints have been made during the past week or two of the poor lighting of several of the towns in Cornwall. Those in view of the sea are practically in darkness, and in others the lamps are so obscured that they give little light, and the streets are frequently described as being dangerous after dark. At a meeting of the Penzance Chamber of Commerce, the Chairman (Mr. W. H. Eva) urged that representations should be made to the Town Council, and said that accidents had occurred through the extreme darkness of the streets. Mr. Newall, endorsing this complaint, described some places in the town as positive death-traps under the conditions prevailing last winter. Mr. J. Richards, a member of the Corporation Lighting Committee, thought that an improvement would be made this winter; but the matter rested with the police rather than the Town Council. Another town from which complaint comes is St. Austell, which was described at a recent meeting of the Urban District Council as "the darkest place in England," and the lighting of the lamps as "a ridiculous waste of money, as they give so little light." Truro, Falmouth, and Launceston also find that the lighting is inadequate; but at Bodmin there has been some improvement. In several of these towns the lighting is compared with that of London and Plymouth, which is said to be much brighter than that allowed in Cornwall. Some of the comparisons appear, however, to be made without knowledge of the actual conditions prevailing. In Plymouth, for instance, there are no lights at all except in a few main thoroughfares, and in these the lamps are so darkened that they do not light the roadway, and all are extinguished at 11 o'clock.

REGISTER OF PATENTS.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Oct. 10.]

Nos. 14,105—14,494.

Charleton, C. P.—"Gas-bags for motor-cars." No. 14,235.

Cocking, A. T.—"Manufacture of nitric acid and ammonium sulphate." No. 14,431.

Cocking, A. T.—"Manufacture of nitric acid, ammonium nitrate, ammonium sulphate, calcium carbide, and calcium cyanamide." No. 14,485.

Dale, Brown, & Co.—"Gas-producers." No. 14,271.

Drake, J. W., & Drakes, Ltd.—"Retorts and apparatus for the manufacture of gas." No. 14,317.

Glover, T.—"Gas-meters." No. 14,142.

Halsall, A.—"Controlling fuel supply to engines of motor-vehicles driven by gas." No. 14,183.

Ionides, A. C.—"Gaseous-fuel furnaces." No. 14,296.

Kynoch, Ltd.—See Cocking. Nos. 14,431, 14,485.

Lea, F. M.—"Gas heating-stoves." No. 14,272.

Newall, J. C.—See Dale. No. 14,271.

Porge, P.—"Increasing the output of light hydrocarbons in the manufacture of oil, gas, &c., from mineral oils, &c." No. 14,359.

Strache, H.—See Porge. No. 14,359.

Wilkinson, F. A.—"Gas-containers for motor vehicles." No 14,125.

LEGAL INTELLIGENCE.

ENEMY COAL-TAR PATENTS.

An important series of German dyes, derived from coal-tar products, was the subject of an application in the Patents Court last Thursday, when British Dyes Limited applied for licences to use 27 patents belonging to the Greisheim-Elektron Company, the Aktiengesellschaft fur Anilin Fabrikation, Cassella's, and the Friedrich Bayer Company. This brings up the number of German patents for which British Dyes Limited have applied to between 70 and 80. All licences for which the Company hitherto asked were granted.

The Controller of Patents (Mr. Temple Franks, C.B.) intimated that he should recommend the Board of Trade to issue licences in this further series of applications. The development of the British dye industry was a concern of public importance; and these dyes were urgently needed in the Yorkshire and other dyeing areas.

It was stated that one of the dyes has a pharmaceutical value, like the dyes known as Acri-Flavine and brilliant green, which the British doctors of the Bland-Sutton Institute have lately discovered to be the best antiseptics for war surgery that have come under the notice of the medical profession. They promote, with no injurious effect, the healing of wounds with a rapidity hitherto unheard of. The therapeutic agent now applied for in the list of 27 dye patents is not an antiseptic, however, but a drug for injection into the veins. It is efficacious in such maladies as malaria, and possesses the unique property of attacking the parasites of disease without exerting any injurious effect on the corpuscles of the blood.

Charge against Sheffield Gas Workers.—Much interest will be aroused in Sheffield industrial circles on Thursday, when the Sheffield magistrates will investigate an unusual charge to be preferred against a number of workmen, employees of the Sheffield Gas Company. The case was mentioned at the Police Court, last Thursday, to Messrs. E. H. Banner and W. W. Chisholm, when the men were charged with "wilfully and maliciously breaking a contract of service, and having reasonable cause to believe that the consequences of such act would be to deprive the inhabitants of the said city to a great extent of their supply of gas, contrary to the Conspiracy and Protection of Property Act, 1875." Alternatively, the defendants are sued for damages for breach of their contract. At the outset of the proceedings, one of the defendants asked for an adjournment in order that they could consult with their Trade Union officials, who were at the moment out of town. Mr. T. E. Ellison, who appeared for the prosecutors, agreed to an adjournment until Thursday next.

Workmen's Compensation Act Application.—At the Exeter County Court, last Wednesday, Mr. G. H. Harris applied, on behalf of Messrs. Willey & Co., for the cessation of an order made under the Workmen's Compensation Act for the payment of 5s. a week to a workman named Bates, aged 21, an improver, who, while employed at the works, lost four fingers of one of his hands. Mr. Harris said the firm had expressed willingness to take the man back; but he had declined to accept the work. Since the action, he had been receiving compensation; and now he had taken a situation at 21s. a week, which was the amount of his previous earnings. Mr. M'Gahey, who represented Bates, said the man, who lost every finger on his left hand, was unable to accept the offer to go back to Messrs. Willey's employment, because his nerves could not stand the noise of the factory. Although the man had been permanently incapacitated, the firm now asked for complete termination of liability. To this he could not consent; but he was willing to agree to the reduction of the compensation to 1d. a week, with liberty to apply again. Mr. Harris accepted this offer.

The Perth gas workers have been granted an advance of 3s. per week Sir James Urquhart, of Dundee, was Adjudicator in the wages dispute between the workers and the Corporation. It is understood that a protest against the award has been entered.

MISCELLANEOUS NEWS.

INCREASED PRICE OF COAL.

An Addition of 2s. 6d. Per Ton.

In an announcement, dated Oct. 12, the Board of Trade state that they have increased the price of coal at the pit's mouth by 2s. 6d. a ton, to meet the cost of the war wage recently granted to the miners. The increase takes effect in the case of house coal from yesterday (Oct. 15), and in the case of other coal from Sept. 17. It does not apply to coal exported to the Allies.

In making this addition to the price of coal, increased costs of production other than the war wage have not been taken into account. Applications made by certain districts for an increase in the "standard amount" under the Price of Coal (Limitation) Act are at present being examined by the Controller of Coal Mines.

Prices of Coal for Shipment.

A series of amendments of the Directions of the Controller of Coal Mines of June 28 as to the Sale of Coal for Shipment have been issued, together with a revised schedule of prices, making provision for a general increase of 2s. 6d. per ton (except in the case of shipments to France and Italy), in consequence of the war wage recently granted to the miners.

This increase applies to all sales of coal for bunkering ships at ports in the United Kingdom, as well as of coal for shipment as cargo. The general conditions affecting the sale of coal for bunkering have also been modified in certain respects.

The alterations came into operation yesterday (Oct. 15).

The amended directions as to the sale of coal [dated Oct. 12] state, in connection with the sale of coal for consumption in the United Kingdom, that "the requirement that no coal shall be sold by collieries for consumption in the United Kingdom, except at the maximum prices under the Price of Coal (Limitation) Act, shall be subject to the condition that in any case in which the maximum price chargeable by a colliery for a particular class of coal for consumption in the United Kingdom is higher than the price specified in a schedule appended, the colliery may charge for such coal for inland consumption prices lower than the said maximum, but in no case (whether sold in truck at pit or f.o.b.) less than the price specified in the schedule.

The schedule prices, so far as they specially concern "Journal" readers, were given in the issue for July 3 last, p. 29. They are, as stated above, now subject to an increase of 2s. 6d. per ton to meet the recent war-wage increase, except in the case of shipments to France and Italy, and coal for the manufacture of patent fuel for shipment thereto.

CITY AND GUILDS OF LONDON EXAMINATIONS.

Examiners' Reports.

Mr. L. G. Killby, of the City and Guilds of London Institute (Department of Technology), sends extracts from the reports of this year's Examiners in "Gas Engineering," "Gas Supply," "Gas Fitting," and "Coal Tar Distillation;" and these are given below.

11 A.—GAS ENGINEERING.

[For questions, see "Journal" for May 8, p. 250.]

The quality of the work done in the examinations was good. Many of the candidates showed by the method and matter of their answers that they were receiving a good grounding in gas engineering.

There is a marked improvement in the sketching of retort-settings and of parts of plant described—more especially in Grade I.; and candidates seem to be realizing the importance of this.

For the guidance of teachers and candidates, it was observed that only one candidate who tackled the station-meter question placed the inlet pipe correctly. Some have not yet been taught the process of gas-stripping as distinguished from the purifying of gas. Governors and their control and use are subjects in which some students are weak; and it would be well if it were kept more clearly in view that the subject of gas engineering includes details of all operations and apparatus not only on the works, but up to and within the consumers' premises.

11 B.—GAS SUPPLY.

[For questions, see "Journal" for May 15, p. 302.]

In previous years attention has been drawn to the unequal relative value of the answer papers as between the two divisions. The same characteristic presents itself this year; but, whereas previously the advantage in general excellence has been upon the side of Grade I., this year the papers in the final examination are relatively much superior.

Grade I.—The answers to Questions 6, 7, and 8 revealed marked weaknesses. Many candidates appeared ignorant of the principle of regeneration as applied to burners and lamps, and had but vague ideas as to the constructional details of the windproof lantern. Perhaps the greatest and most inexcusable failure was in connection with the simple calculation involved in Question 8; many of the candidates arriving in their answers at absurdly incorrect results.

Final Examination.—The difficulties in the final examination were mainly in connection with Questions 3, 5, 8, and 10. Very few of the candidates attempting No. 3 showed that they grasped the difference between ascertaining the illumination over the area of a thoroughfare and the taking of a test at a single point. Notwithstanding the great amount of attention given to the subject of testing gas-fires for radiant efficiency in recent years, and the large amount of space which the Technical Press has devoted to the subject, many of the candidates had very hazy notions either as to the principles involved or

the practice adopted for this purpose. In connection with Question 8, most of the candidates arranged the tanks in sets of four for each engine, instead of availing themselves of the opportunity for a more thorough cooling of the circulating water offered by the large cluster of tanks. The answers to Question 10, with very few exceptions, showed failure to appreciate the effect on the direction of the illumination caused by enclosing the light in a half-opal or a half-frosted globe. The general level in this grade was, however, much higher than for several years past, and speaks well for the thoroughness of the instruction.

11 C.—GAS-FITTING.

[For questions, see "Journal" for May 15, p. 303.]

In Grade I. the papers were of a very much higher standard than in any previous year, and reflect credit on the candidates. But compared with previous years and with allowance for greater difficulty in the questions, the written papers in the Grade II. and Final examination were not up to the usual standard, and showed that careful tuition was necessary in most of the branches. Questions 2 and 3 in the Final examination, and Question 1 in Grade II. were well answered in almost every paper—proving that the candidates were familiar with such work. But on the other subjects not so often met with in their daily routine, they showed a lack of knowledge.

English and spelling require more careful study on the part of the candidates to make their meaning intelligible.

COAL TAR DISTILLATION.

The standard of the answers in Grade I. was hardly up to that of last year, and teachers will do well to insist again that candidates read the questions very carefully before commencing their answers. In one respect, both grades show a marked improvement—the diagrams given being drawn with more attention to the principles involved in the apparatus illustrated. There are, of course, many exceptions; but evidently much more care has been bestowed on this part of the teaching. In the Final examination, the practical answer papers were very good; and some of the theoretical papers showed an intelligent grasp of the subject. But many of the candidates would have done better if they had not wasted too much time in spinning out answers to the earlier questions.

GENEVA GAS SUPPLY.

A Year's Working.

The Municipal Gas-Works of Geneva is marked among other establishments for the completeness of the data which it publishes in regard to each year's working. Those for 1916, which have just appeared, are of somewhat more than ordinary interest, inasmuch as they relate to the first complete twelve months' employment of the town's new Chatelaine Works, and further reflect the circumstances of the time in regard to the quality and price of coal. In transcribing these technical and commercial particulars into these pages, the Continental measures have been rendered into British units, with the exception of the metric "tonne," which is only 1·6 p.ct. below the British ton. The pound sterling has been taken as 25 frs. in all the conversions of the money figures.

During 1916, seven to nine benches of eighteen vertical retorts were in use; but the gas production fell below that of recent years as a result of bad quality of the coals—chiefly Belgian and with high contents of ash and dust and deficiency in volatile matter. Of the total quantity (49,071 tonnes) of coal, 8187 tonnes came from the Saar, 20,524 tonnes from the Ruhr, and 20,359 tonnes from Belgium. The total consumption of gas was 552·2 million c.ft., as compared with 502·7 millions in 1915—an increase of 9·822 p.ct. The total make of gas rose from 503·1 to 552·7 million c.ft., representing 9·829 p.ct. The coal carbonized was 50,577 tonnes, as compared with 41,342 tonnes in 1915—figures which have their counterpart in the diminished yield during 1916—11,102 c.ft. per ton, against 12,340 c.ft. in the preceding year. The average price of coal at the works was 47 fr. 87 c. (£1 18s.) in 1916, an increase of just under 7 fr. (5s. 7d.) over 1915.

The results of the first complete year's working with the new plant in comparison with those of 1915 are as follows:

	1916.		1915.
Number of working days of furnaces (each of eighteen vertical retorts, 16 ft. long)	2811	..	2372
Number of retort working days	49,940	..	40,254
,, ,, charges	89,720	..	75,677
Coal carbonized per day per furnace	39,680 lbs.	..	37,940 lbs.
,, ,, ,, retort	2233 ,,	..	2236 ,,
,, ,, retort charge	1241 ,,	..	1188 ,,
Gas produced per furnace per day	196,595 c ft.	..	209,282 c.ft.
,, per retort per day	11,054 ,,	..	12,325 ,,
,, per retort charge	6145 ,,	..	6533 ,,
Coke used in heating furnaces	7762 tonnes.	..	6554 tonnes.
,, per 1000 c.ft. of gas	30·90 lbs.	..	28·77 lbs.
,, per ton of coal	343·6 ,,	..	355·1 ,,

The coke used as fuel for the retort furnaces amounted to 15·34 p.ct. of the coal carbonized; that sold was 71·41 p.ct. of the total coke produced, equivalent to 53·8 p.ct. of the coal. The balance (13·25 p.ct.) is represented by coke used, partially as dust and breeze, for raising steam in stationary and locomotive boilers.

The total tar produced was 1677 tonnes, equal to 3·31 p.ct. of the coal. Pitch totalled 23·9 tonnes.

The production of ammoniacal liquor was 507 tonnes, testing 22·96 p.ct. ammonia, equivalent to 116·4 tonnes of real ammonia (NH_3). The concentrated liquors corresponded with 1·002 p.ct. of the coal carbonized; the yield of ammonia thus being 5·15 lbs. per ton of coal. The lime used was just under three-fifths of the ammonia produced.

Statistics of gas consumed record 84·86 p.ct. of the total passing the works meter as registered by consumers' meters, 5·4 p.ct., for public

"Richmond" Gas Furnaces
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Illustration shows part of an installation of "Richmond" Gas Furnaces for the heat treatment of Shell Driving Bands. The speed of production and accuracy of the work turned out by these Furnaces is such that Engineers are constantly visiting this Workshop to become acquainted with the remarkable efficiency of the installation. Our staff of Furnace experts are at your disposal to co-operate on any heat treating proposition.
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lighting, and 1·28 p.ct. for other paid consumption. The remainder is made up of 0·77 p.ct. consumed in works and offices of the undertaking, and 7·69 p.ct. unaccounted for.

The total population served by the works being 126,934, the total make corresponds with 4351 c.ft. per head, and the total consumption registered by the meters of 35,398 customers (36,301 meters), with 13,208 c.ft. per customer, or 3690 c.ft. per head of the population.

Analysis of the customers according to quantity of gas consumed showed seven taking more than 706,300 c.ft.; 21, from 353,200 to 706,300 c.ft.; 33, from 176,500 to 353,200 c.ft.; 19, from 141,200 to 176,500 c.ft.; 29, from 105,900 to 141,200 c.ft., and 35,289 taking less than 105,900 c.ft. per annum. A notable item in reference to meters is that, of 36,301, only three are of the prepayment type.

At the 1916 price of 5s. per 1000 c.ft. (5s. 8d. in the case of more distant parts of the system), sales to consumers have realized £117,750, an increase of £11,280 upon 1915. Public lighting returns at £3750, on the other hand, show a reduction of £570.

Sales of coke and carbon, less cost of distribution, &c., have netted £46,340—an excess of £14,070 on the previous period, as a result of enhanced prices for coke and direct sales to the public. Per tonne of coal carbonized, the net revenue from coke has been 18s. 4d., as against 15s. 7d. for 1915.

The net sales of tar, after deduction of transport charges in tank wagons, were £4815, an increase of £1400 over the previous year. Per tonne of coal, this revenue was 1s. 10d., against 1s. 7d.

Ammoniacal liquors, less cost of lime and transport, were £7010, or £3010 better than the previous year. Cost of steam and labour is not included in the deduction—these items going into general establishment charges. The revenue from this source per tonne of coal carbonized was 2s. 9d., as compared with 1s. 10d. The price obtained for ammonia was slightly more than double that in the previous year.

In the laboratory at Geneva, in addition to the routine chemical and physical measurements, an exhaustive study of tar distillation has been undertaken on the establishment of distilling plant in the works, and experiments have also been carried out on a semi-working scale of benzol recovery from gas by the Darier process. The "Luxmasse" material used in the works' purifiers was found to consist of: Ferric hydroxide, 41·34 p.ct.; inert substances, 7·45 p.ct.; and moisture, 51·21 p.ct. The spent material contained 50·65 p.ct. of sulphur and 4·61 p.ct. of Prussian blue.

Gas Rationing.

The same issue of the "Journal des Usines à Gaz" from which the above particulars are taken states that from Oct. 1 until further notice the town of Geneva has adopted a drastic system of rationing gas, according to which 6s. 2d. per 1000 c.ft. is charged for gas up to 1400 c.ft. consumed in one month. For quantities greater than 1400 c.ft. per month, the price is 6s. 10d. per 1000 c.ft. Any gas consumed in excess of the statutory allowance (see below) is taxed at the rate of 22s. 8d. per 1000 c.ft.

The rationing provides the following maximum consumptions for households of various sizes per month: One person, 420 c.ft.; two persons, 630 c.ft.; three persons, 810 c.ft.; four persons, 950 c.ft.; five persons, 1060 c.ft.; six persons, 1160 c.ft.; seven persons, 1270 c.ft.; eight persons, 1380 c.ft.; nine persons, 1480 c.ft.; ten persons, 1590 c.ft.; eleven persons, 1700 c.ft.; twelve persons, 1765 c.ft.

The ration for twelve persons is the permissible maximum, to be exceeded on grounds of health supported by a medical certificate. Business and other premises are restricted to half the average consumption of the last quarter of 1916.

GAS-MOTOR VEHICLES IN EDINBURGH.

The Streets and Buildings Committee of the Edinburgh Town Council have not shown any willingness to encourage the use of gas for motor vehicles. The Scottish Motor Traction Company, who own a large number of motor buses, made an unsuccessful application recently for permission to fill their gas-bags in a central square in the city. This was followed by a letter to the Committee from the Gas Commissioners in which it was suggested that a portion of one of the arches at Jeffrey Street, at present used by the City Roads Department, would be a convenient place for the erection of a gas-filling apparatus for vehicles. The Committee not only agreed to recommend refusal of the application, but also recommended the Council to refuse to allow motor buses to be filled anywhere in the public streets. They suggested that as the site of the old Edinburgh Gas-Works was not many yards away from Jeffrey Street, the Gas Commissioners, who still owned the property, might erect their bag-filling apparatus there.

At the suggestion of the Lord Provost, the question has been referred back to the Streets and Buildings Committee. There is a feeling in the city that the Committee took a narrow-minded view of the matter. It appears that they were influenced in coming to their decision by the argument that the streets belong to the town as a whole, and that the Corporation have no right to assist individuals or companies in the furtherance of their business projects. If a filling-place is wanted, let them rent one, and not ask the Corporation to give them permission to obstruct the thoroughfares, and possibly cause a nuisance, if not something more serious. This sort of reasoning would have been sound if we had been living in normal times; but it is a stiff-necked and uncompromising attitude to take up in these days, when punctilious ideas are at a heavy discount.

As was pointed out in an article in the "Edinburgh Evening Dispatch," it looks as if the town authorities were not fully alive to the importance of recent developments in the substitution of coal gas for petrol; and in view of the fact that the Explosives Departments of the Ministry of Munitions recommend the extended consumption of gas for the sake of the bye-products used in the manufacture of

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T.N.T., &c., and that by the substitution of coal gas for petrol in propelling motor-cars, 700,000 gallons of petrol a year are released for official use, it seems a pity that encouragement should not be given to the enterprise in its initial stages in Edinburgh.

A representative of the Scottish Motor Traction Company has stated that the Company would consume for bus purposes from 50 to 60 million c.ft. of gas per annum, and that their annual bill with the Gas Commissioners amounts to from £7000 to £10,000. He hinted that if the city continues to refuse facilities, the Company may obtain the gas they require elsewhere.

NEW GAS-WORKS PROJECTED FOR SHEFFIELD.

Huge Establishment at Wadsley Bridge.

The Sheffield Gas Company will at no very distant date, says the "Sheffield Daily Telegraph," start on new works which are to be erected near Wadsley Bridge Station. They are wanted badly. Their output could almost be used to the full to-day; but unfortunately they will not be completed for some years.

In the meantime, the Company are asking for economy in the use of gas. This is important from a national point of view. The Company have gone so far as to take all the gas-fires out of the offices in Commercial Street. Mr. Hanbury Thomas, the General Manager, pointed on Thursday to a coke-fire in his room. "It is the first time for thirty-five years," he said, "that I have had anything but a gas-fire here."

A fact like this should show the need for economy. The Company have issued advertisements asking all consumers to curtail in every possible way the quantity of gas they use, either for lighting, heating, cooking, or any other purpose.

And yet the fact remains that the consumption of gas increases by leaps and bounds, and has increased seriously even since the Company asked for economy. The request is made in the national interest. The Company desire to keep up the supply to the munition works as much as possible; and everybody who assists in this direction, by burning less for domestic purposes, will be doing a war service.

In the month of September the quantity of gas consumed in the city was 13·93 p.ct. more than in September, 1916; while that month showed an increase of 13·21 p.ct. on September, 1915.

The increased consumption last week was startling. The total quantity used on Monday was 19,558,000 c.ft.; Tuesday, 20,270,000 c.ft.; Wednesday, 19,996,000 c.ft. Compared with two years ago, these figures showed an increase of five millions on Monday, five millions on Tuesday, and four millions on Wednesday—a total increase of fourteen millions, which represents 1300 tons of coal, in three days. It is unfortunate that the weather has turned colder just when the Company are appealing for economy. People who have gas-fires have naturally made more use of them. Mr. Hanbury Thomas would rather they used coke. He has plenty, if people will fetch it. He will deliver it as well as he can, but the scarcity of carters is a difficulty.

The root of the matter, however, is the shortage of workmen in the gas-houses themselves. If the works were fully staffed, they could produce 22 million c.ft. per day; but at present they are only turning out 17¼ millions. It is only by storing up gas at the week-end that the Company are able to carry on as well as they are doing; and they announce that, under existing circumstances, they will have to reduce the pressure from time to time.

Strong representations have been made to the Ministry of Munitions with a view to obtaining more men; but up to the present the necessary supply has not been forthcoming. A year ago a military party of 150 was sent to the works. Of these, only 61 now remain; and, as many of them are Scotchmen and anxious to return to their homes, it is feared that they will take advantage of the abolition of leaving-certificates, and be lost to the Company.

The General Manager of the Company has suggested that it would be to the advantage of the Government that a number of strong men, able to work in the retort-houses, should be found, even if they are withdrawn from the Army. "I must warn you," he said in a letter only a day or two ago, "that it is no longer a matter of conjecture, but it is a certainty that unless labour is found for us, and that promptly, the supply of gas will, towards the end of each week, entirely run out."

The new works of the Company, which will be erected as soon as possible, are to be on an extensive scale—larger than any single works which the Company have at present. They will be situated just beyond Wadsley Bridge Station, on the Great Central Railway, where the Company have already acquired a site of 42 acres and are purchasing further land, which will bring up the total area to over 50 acres.

The present works of the Company have a producive capacity of 22 million c.ft. per day; and the plant to be installed at the new works will have a capacity of 15 million c.ft. per day. The estimated cost is upwards of £1,000,000. The Company have already obtained parliamentary powers to raise the necessary capital, and propose next year to apply for a Provisional Order to authorize the erection of new works on the site. It will be two or three years before any part of the works is in operation.

Widnes Gas Advanced in Price.—At last week's meeting of the Widnes Town Council it was decided to increase the price of gas by 3d. per 1000 c.ft. to all classes of consumers. The price will now be 1s. 6d., at which figure it retains the distinction of being the cheapest gas in the kingdom. The next lowest price (1s. 9d.) is charged in Sheffield.

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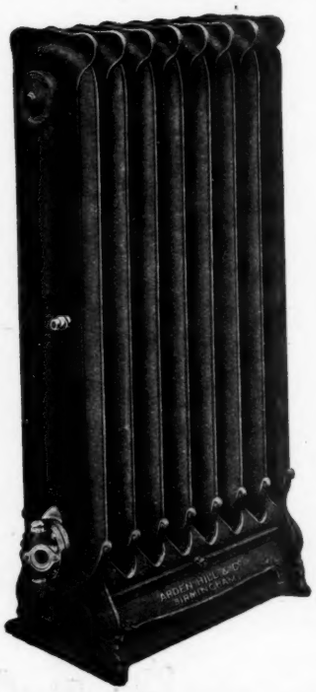


DOUBLE-COLUMN RADIATOR.

PUBLIC LIGHTING IN THE EAST END OF LONDON.

The Stepney Borough Council report the receipt of a communication from the Engineer and General Manager of the Commercial Gas Company intimating that his Directors are reluctantly compelled to revise the present lighting rates charged to the Council (owing to the heavy increase in wages and the cost of raw materials); referring to the fact that the Company have not hitherto increased the public lighting rates; and enclosing a revised schedule of rates chargeable for lamps for public lighting within the borough, to take effect from Jan. 1 next.

The following statement shows the existing and the revised charges:

Description of Lamp.	Present Rate per Lamp per Annum. £ s. d.	Revised Rate per Lamp per Annum. £ s. d.
No. 3 Kern	2 9 0	3 4 4
No. 4 Kern	2 18 0	3 13 4
"C"	—	3 9 0
Flat-flame	3 9 0	4 7 0
"C" with pilots	3 9 0	4 0 8
No. 4 Kern with pilot	3 9 0	4 5 4
Two-light No. 3 Kern	4 18 0	6 8 8
Two-light No. 4 Kern	5 15 4	7 6 0
Three-light No. 4 Kern with pilot	8 5 6	10 14 0
Three-light "C"	8 5 6	9 18 0
Three-light No. 3 Kern	8 5 6	10 11 4
Three-light No. 4 Kern	8 5 6	10 11 4

Street Lighting in the Potteries.—Strong feeling as to the inadequate lighting in the streets of the Potteries was expressed at a meeting of the Stoke-on-Trent Watch Committee at Hanley last week. After a long discussion the Committee instructed the Chairman (Alderman J. H. Edwards) and the Chief Constable to visit London, Birmingham, Manchester, and Sheffield, with the object of inspecting the lighting arrangements in these cities, in order to see if some arrangements could not be made to improve the lighting of the streets. Alderman Ball said he had made a tour of streets in Manchester; and the city was a great deal better lighted than the Potteries.

Todmorden Gas-Works' Accounts.—The annual statement in connection with the working of the Todmorden Corporation Gas-Works shows that the gross profits for the year were £7132, compared with £7833 in the previous year. The net balance, after allowing for depreciation, reserve fund, works improvements, and the allocation of £500 for the relief of the rates, is £744. During the year 13,285 tons of coal were used in the manufacture of 158,443,000 c.ft. of gas; the amount sold per ton of coal being 10,832 c.ft. There was a decrease of 15,060,715 c.ft. (or 9·39 p.ct.) in the amount of gas sold; this being due to the public lighting restrictions and the operation of the Summer Time Act. The price of gas throughout the year was 3s. per 1000 c.ft. for lighting, and 2s. 6d. for power.

PORTABLE GAS.

Remarking that "there is nothing new under the sun," Mr. Fredk. A. Price, of Manchester, draws attention to a paper read by Mr. John Shuttleworth before the Statistical Section of the British Association at Manchester, in 1861. In this, the author referred to a Provincial Portable Gas Company established in London in 1825. As gas used for motor vehicles may, Mr. Price says, without any stretch of the imagination be called "portable gas," he rightly surmises that interest will attach to the subjoined extract from the paper which he encloses. The Gaythorn Gas-Works of the Manchester Corporation stand on the site upon which the Provincial Portable Gas Company carried on their operations 92 years ago.

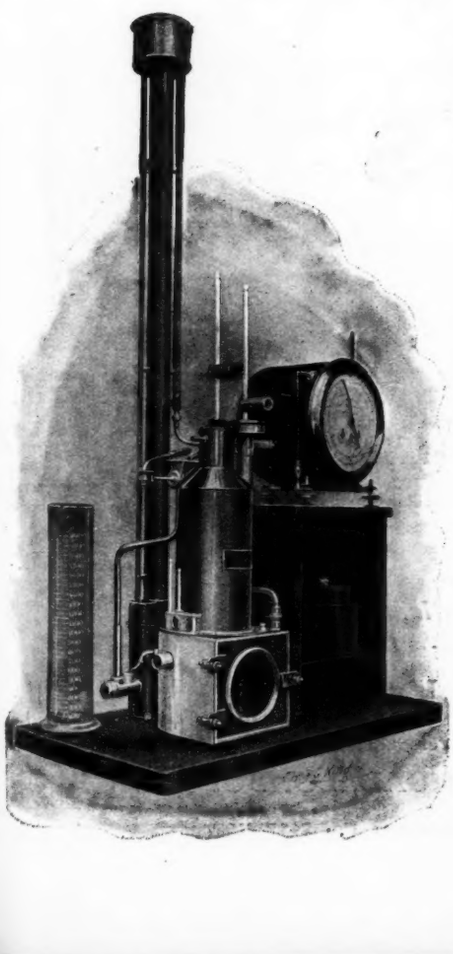
Origin of the Gaythorn Works.

About the beginning of 1835, the important question of the purchase of Mr. James Fernley's gas-works at Gaythorn, Hulme, was first mooted. The history of these works is briefly as follows:

In 1825, a Company was established in London called The Provincial Portable Gas Company, which, in December of the same year, purchased a plot of land in Hulme, and erected thereon a gasholder and other apparatus. The business of the Company was the sale of gas in a condensed and (as the title indicates) portable form. It is the only Gas Company that ever existed in any of the townships now comprised within the City of Manchester; but the extent of its works and the quantity of gas which it disposed of were apparently, comparatively speaking, so small that it is scarcely entitled to consideration. Doubtless, the cause of its failure was the competition with the Commissioners' works to which it was subjected. The Company continued in possession of the works for six years, and then, not finding them sufficiently profitable, advertised them for sale. They were, on Dec. 12, 1831, purchased by Mr. James Fernley for £5650. Mr. Fernley extended the works, and introduced a system of mains; but he soon found himself unable to compete with the larger establishment of the Manchester Gas Directors, and in January, 1835, made a proposal to the Directors the object of which was a sale to them of his works. At first, owing to the large outlay which the purchase involved, the Directors did not favourably entertain Mr. Fernley's overtures; and the matter lay in abeyance for two years.

However, on Jan. 26, 1837, a Committee was appointed to confer with Mr. Fernley; and, as the result of the negotiations, a report was, on May 12, 1837, drawn up for presentation to the Commissioners of Police. It was stated in this report that the purchase of the works would afford a fair remuneration, and the arrangement would be most desirable and beneficial to the inhabitants of Manchester and its vicinity. The proposal was sanctioned by the Commissioners on May 18, 1837; and the Directors were empowered to apply for the necessary parliamentary powers. This application resulted in the passing, on July 12, 1837, of the Act 1 Vic., Cap. cxii., intituled "An Act for enabling the Directors of the Manchester Gas-Works to purchase land, buildings, and apparatus for the extension of their works," which authorized (*a*) the Gas Directors to purchase the works, land, gasometers, retorts, pipes, lamps, and other apparatus belonging to Mr. Fernley, with full power; (*b*) to manage those works; and for the accomplishment of such purchase, the Directors were empowered (*c*) to borrow the further sum of £30,000 on the security of the gas-works, rents, and profits, with a proviso

SIMMANCE'S PATENT



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that the aggregate debt upon that security should never exceed £100,000. The Act also contained (*d*) a proviso directing the application of the income from the works authorized to be purchased, in the same manner as that derived from the other gas-works under the control of the Directors.

The purchase was completed on Sept. 2, 1837. The works (the site of which contained upwards of 12,000 square yards) comprised four gasholders, two retort-houses, other necessary buildings and apparatus, and mains and pipesin Chorlton-upon-Medlock, Hulme, Manchester, Ardwick, and Rusholme. The purchase-money was £19,800.

These works had thus been in existence twelve years at the time they came into the possession of the Local Authority of Manchester. As has been observed, they were the only works carried on for the benefit of private individuals from which gas was ever supplied within the area of the city, if we except the private works attached to certain large mills and other premises.—*British Association Report*, 1861.

INCREASED WAGES QUESTIONS.

The Birstall District Council have decided upon an advance of 3s. per week to the gas workers as additional war bonus; making a total of 10s. advance on pre-war wages, and in accordance with a recent arbitration award for gas workers in the district. In view of this increase of wages, the advance in costs of materials, and the estimated adverse balance upon the last half-year's working of the department, the price of gas has been increased by 3d. per 1000 c.ft.

The Sowerby Bridge Urban District Council have agreed to the advance of the wages of the foremen stokers at the Sowerby Bridge and Luddendenfoot Gas-Works to a figure totalling 10s. per week above the pre-war wages (in operation up to August, 1915), based on a 6½ day week. The wages of some other workmen have been advanced by 2s. per week.

The Gas Committee of the Goole Urban District Council have decided to recommend the increase of the gas workers' war bonus to the figure of 15s. per week above pre-war wages.

The Burnley Corporation Gas Committee have agreed to pay their workers proportionately for overtime on top of the recent war bonus granted them.

The Halifax Corporation employees have decided that their demand for increased wages, rejected by the Town Council, be submitted to arbitration. The men's demand is for a further 6s. per week, bringing the war bonus to 15s. above their pre-war wages. In August they demanded 12s. above pre-war rates, and the Committee on Production granted 9s., which was 1s. advance on what the Corporation had given. The men now hold that since then employees of other corporations have obtained better awards.

The Ossett Gas-Works accounts, submitted last week, show a loss on the undertaking during the past year of £995, which is more than accounted for by an increase of over £2000 in income-tax.

GAS LIGHTING AND VENTILATION.

Popular Fallacies.

In a communication to the "Bulletin" issued by the National Commercial Gas Association of America, Mr. Thos. Schofield refers to the very general impression that gas lighting vitiates the air by extracting oxygen, giving off carbon dioxide, heat, and dryness, and soon renders the surrounding atmosphere impure in a hygienic sense, and especially that the reduction of the oxygen content is injurious to health.

Mistakes arise by accepting general statements, without reference to the qualifying influences of proportion or quantity, and closer investigation proves that the use of gas is neither deleterious to health nor is it opposed to good hygiene or sanitation. The combustion of 1 c.ft. of gas required 6 c.ft. of air, which certainly meant that some oxygen was extracted. But careful experiments conducted by Lord Haldane and Dr. Leonard Hill proved that even a considerable shortage of oxygen was in no sense detrimental to life or health. Several persons enclosed in an air-tight compartment were quite unaware of any change in the atmospheric conditions when the percentage of oxygen had been reduced to 16, and were surprised to find that they could not ignite a match or keep a cigarette going. Discomfort was not experienced until the oxygen was reduced below 15 p.ct., which was ample proof that, so far as the extraction of oxygen was concerned, conditions under the worst possible circumstances of ventilation were absolutely innocuous. The percentage of water vapour in the air affected the condition of the skin, and its ability to adequately perform the proper functions. If the degree of humidity, the proportion of water as compared with the saturation point, was high, evaporation from the surface of the skin was retarded, and discomfort soon followed. In a crowded room, the air in contact with the skin was heated close up to body temperature, and saturated with moisture; cooling by radiation or evaporation was greatly hindered; an unnatural sweating or flushing resulted; blood stagnated near the surface of the skin, depriving the internal organs of proper circulation; and hence discomfort and fatigue. It was a matter of temperature and humidity, rather than of chemical composition. The thermometer was of little value as an indicator of temperature, as it did not show the influences of moving currents, or the changes in cutaneous excitations. The two most important conditions were free movement of the air to prevent stagnation, and a sufficiently low degree of humidity to admit of the skin doing its natural work. The atmosphere might be circulated by mechanical means, such as fans, or by temperature differences; and of the two, the second was preferable, as largely eliminating extensive local draughts.

The requirements are efficiently met by the use of gas for lighting, although 1 c.ft. of gas produced 1 c.ft. of carbon dioxide as well as 1½ c.ft. of water vapour; and, according to theory, as ordinary outside air contained 4 parts of carbon dioxide to begin with, a room lighted by gas-burners, and also containing occupants who would also give off

BRADDOCK'S
RETORT-HOUSE
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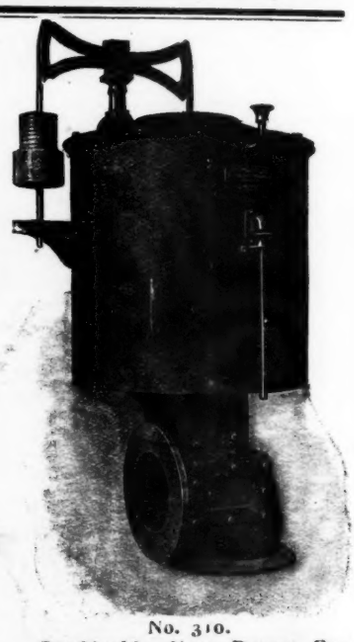
HAVE PROVED TO BE
SECOND TO NONE.

Many repeat orders have been received.

Braddock's New Patent Retort-House Governor is a further improvement and is especially desirable for use with Vertical Retorts.



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Telegrams: "METRIQUE, LAMB LONDON." Telephone No: 2412 HOP.

carbon dioxide and moisture, with organic matters in addition, must speedily exceed the sanitary limit of 6 parts of carbon dioxide in 10,000, and become so vitiated as to be dangerous to health. But the diffusion and air currents set up by the heat of the gas flame secured very different conditions in practice, even if the room was made practically air-tight. Heated air rises; and the foulest air in the room would be found close to the ceiling. The materials used for the construction of walls and ceilings are porous, and hot gases diffuse through them with considerable rapidity; so that, in the absence of other ventilation arrangements, the hot gases are removed before they have an opportunity of mingling with the air below, and are replaced by cool fresh air drawn in through crevices in doors and window frames. With a source of light that does not produce hot gases, this circulation and diffusion cannot obtain; and the fact that the lights abstract no oxygen does not prevent the air from becoming foul. The gas flame also exercises a useful sterilizing effect by reducing the mass influence of pathogenic bacteria, which are the cause of much disease and loss of life. An atmosphere laden with emanations from skin and lungs, possibly including those from unhealthy people, was an enemy to health; but the high temperature of the gas flame, about 1500°, exercised a strong germicidal action.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Oct.* 15.

In the London tar products market, pitch is the product in which interest is now taken. In some quarters high figures are mentioned; but it is reported that a large maker is prepared to sell to briquette manufacturers at about 45s. net per ton f.o.b. ships alongside works. Creosote is nominally worth 4¼d. net per gallon in bulk *ex* works. Anthracene, 40-50 p.ct., remains at 6d. per unit per cwt., packages free.

Sulphate of ammonia continues in demand on the basis of the official prices for home agriculture.

Tar Products in the Provinces.

Oct. 15.

Markets remain steady. There has been a good inquiry for solvent naphtha; the price is very firm. Other articles remain about the same. The average values for gas-works products during the week were: Gas-works coal tar, 25s. 3d. to 29s. 3d. Pitch, East Coast, 18s. to 20s. per ton; West Coast—Manchester 17s. 6d. to 18s. 6d., Liverpool 17s. 6d. to 18s. 6d., Clyde 18s. to 19s. nominal. Benzol, 90 p.ct., North 10½d. to 11½d.; 50-90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 7¼d. to 7¾d. Solvent naphtha, naked, North, 2s. 6d. to 2s. 8d. Heavy naphtha, North, 1s. 4d. to 1s. 5d. Creosote, in bulk, North, 3¾d. to 4d. Heavy oils, in bulk, North, 4¼d. to 4½d. Carbolic acid, 60 p.ct., East and West Coasts, 3s. 4d. naked. Naphthalene salts, 80s., bags included. Anthracene, "A" quality, 3d. per unit; "B" quality, 1½d. to 2d.

FROM A MARKET CORRESPONDENT.

Tar Products.

There is a fair amount of activity in these products. London pitch keeps firm at late quotations; while the Provincial position shows further improvement. There is rather more tonnage available on the North-East coast, and, consequently, exports have increased; the price remaining about 27s. per ton f.o.b. Newcastle, as mentioned last week. There is, in addition, a very fair home demand for pitch at rather more money than recently obtainable, and, although on balance stocks are still accumulating, there is certainly a more hopeful outlook for pitch in the Provinces than was the case less than a month ago. The scarcity of solvent naphtha has become more pronounced, and quotations are again on the upward grade. For spot, it might be possible to buy at 3s. to 3s. 3d. per gallon; but 3s. 6d. is a more likely price. For forward delivery, 3s. is about the average figure. The nature of the demand suggests a further advance as likely. Naphthalenes are very firm, and no difficulty is experienced in disposing of all available supplies, both refined and crude. Here, again, a further advance may soon be looked for. Creosote is quite nominal, and practically no business is passing outside of Government requirements. Carbolic acid, crude and crystals, is in like position; very little being available for private purchase. A fair demand exists for cresylic acid at late rates; but aniline oil is dull. Toluol and benzol are unchanged. The Benzol Producers' Association is getting to work, and tangible results are hoped for in the near future. The feeling among makers is that if they allow themselves to come under the control of petroleum companies the result might be disastrous. This is emphasized by the fact that there is great competition among such companies, and that benzol might be sold in the course of such competition after the war at a price which would not pay. Considerable anxiety is being displayed by bye-product makers—especially gas undertakings—as to their future supplies of coal, not only as regards quality, but quantity also; and one or two deputations are to wait upon the Coal Controller upon the matter. The range of quotations is as follows:

Aniline Oil (pure): 1s. 3d. per lb.

Benzol: 90% London, 1s. 0½d., North 10½d. to 11½d.; 50% North 1s. 4d. to 1s. 5d. naked per gallon.

Carbolic Acid: 60% East and West Coast 3s. 6d. per gallon; crystals 40%, 1s. 3d. per lb.

Crude Tar: London 30s., Midlands 24s. 6d. to 25s. 6d.; North 25s. 6d. per ton, *ex* works.

Pitch: London 48s. f.o.b.; East Coast, 20s. to 21s. f.o.b.; West

A. E. PODMORE, trading as

Intensive lamp. Dustproof Bunsen Burner lamp for dusty position.

A. E. PODMORE & CO.,

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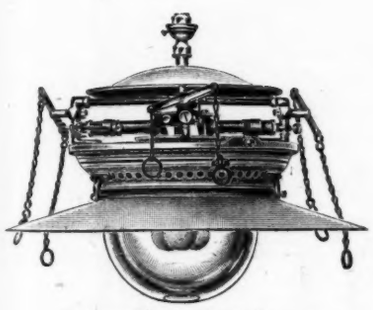
No. 8001 Lamp.

Separate Taps to each Burner.



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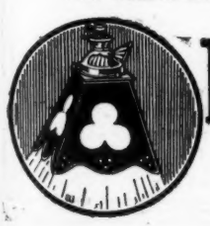

Podmore's Protector

For Shading Lights.

5005 W. Factory Lamp.

Coast—Liverpool and Manchester 19s. 6d. to 21s. 6d. f.a.s., Clyde 21s. per ton.

Solvent Naphtha: Naked London 90-190% 1s. 8d. to 1s. 9d.; North 1s. 3d. to 1s. 4d. per gallon; 90-160% naked London 3s. to 3s. 3d.; North 2s. 9d. to 3s. per gallon.

Crude Naphtha: Naked 30% 8¼d. to 8½d.; North 6¼d. to 6½d.

Naphthalene: Refined £32 10s. to £35; salts 80s., bags included.

Toluol: Naked, London 2s. 4d.; North 2s. 3d.

Creosote: Nominal, London 4¼d.; North 3¾d.; heavy oil, 4½d. per gallon in bulk.

Anthracene: "A" quality, 40-45%, 4½d. per unit; "B" quality, 1¾d. to 2¼d.

Cresylic Acid: 95%, 2s. 6d.; 97-99%, 2s. 6d. to 2s. 7d.; Glasgow 2s. 3d. *ex* works London and f.o.b. other ports.

Grease Oils 18° Tw. (naked), £6 per ton f.o.r. makers' works.

Sulphate of Ammonia.

There is still a good foreign demand for sulphate; but licences cannot easily be obtained, and it is doubtful whether there will be much relaxation in this respect for some time to come. The value of this product as a fertilizer is being more and more appreciated at home, and there is an increasing amount of ordering for forward delivery at the fixed prices. As far as can be anticipated there will be no shortage in supplies; at the same time there will not be much to spare for export, as the home demand, agricultural and official, will absorb practically the whole output. Reports from all quarters confirm the satisfactory working of plants and the increased production of the product. A few shipments have been arranged for in the North; the price being £24 to £25 per ton f.o.b.

Quotations (basis 25 p.ct. double bags): October-December £15 15s. per ton, January-May, 1918, £16 7s. 6d. delivered; 10s. per ton less at makers' works. Export, £24 to £25 per ton f.o.b. London, Leith, Glasgow, Hull, or Liverpool.

COAL TRADE REPORT.

Northern Coal Trade.

There is activity in the coal trade; but the prices are under adjustment following the advance of miners' wages. Steam coal is in good demand. Best qualities are 30s. per ton f.o.b.; second class descriptions are about 27s.; and steam smalls 18s. 6d. to 20s. 6d. What additions there may be to these prices is as yet uncertain. Gas coals are in strong demand, with best Durhams at 25s. per ton f.o.b. Second-class descriptions are quoted at 23s. 6d., and "Wear Specials" are from 26s. 6d. to 30s. The demand for gas coals grows satisfactorily for home use; but exports are impeded. Gas coke is rather higher—from 32s. 6d. to 35s. per ton f.o.b. Freights continue high, both on gas coal and coke.

Limerick Gas Strike.—About 150 men employed at the Limerick Gas-Works went on strike last week, demanding 6s. per week increase in wages; but on the intervention of the Mayor (Mr. T. B. Quin), they accepted an offer of 4s., and returned to work.

Prohibited Exports from the United States.—A revised list of articles the export of which from the United States is prohibited as from Aug. 30 last includes coal, coke, fuel oils, naphtha, benzene, petrol, iron and steel plates, gas-engines, copper, lead, and tin.

Irish Gas Prices.—On the granting of an increase of 3s. per week in stokers' wages, bringing them up to 33s., the Strabane Urban District Council decided to increase the price of gas 5d. per 1000 c.ft. At a meeting of the Ballybay (Monaghan) Town Commissioners, the Gas Company intimated that the price of gas remained for the present 8s. 4d. per 1000 c.ft.

Arrangements for Gas-Driven Cars at Burton.—At Burton-on-Trent, Mr. R. S. Ramsden (the Gas Manager) has issuel the following notification for the benefit of users of gas-driven vehicles: Coke, at 1s. 2½d. per cwt.; gas, at 4d. per 100 c.ft. (including attendance); and water at 1s. per tank (not exceeding 250 gallons), for motor-cars, can be had at the Gas-Works, Wetmore Road, Burton-on-Trent—the commercial centre of the Midlands. Attendance before 7 a.m. and after 5 p.m., or 1 p.m. on Saturdays, 1s. per car extra. These prices are subject to alteration without notice.

Cheadle Gas Light and Coke Company.—At the annual meeting of the Company—Mr. J. R. B. Masefield presiding—the Directors' report showed a deficit on the year of £144. This was mainly due to the serious increase in the cost of fuel and other materials, rise of wages, and the decrease in the consumption of gas. The Directors greatly regretted that no dividend could be paid this year. They also recorded with regret the death of their late Secretary and Director, Mr. W. E. Blagg, and stated that they had elected Mr. W. H. Blagg to be a Director, and Mr. C. J. B. Masefield as Secretary. The report was approved; and Mr. A. Spooner was appointed Acting Secretary, during Mr. Masefield's absence with his regiment.

The Lighting of Sligo.—The lighting of Sligo during the winter is still a subject of negotiation between the Corporation and the Gas Company. The latter had requested immediate payment of the account for last year's lighting; but, owing to financial difficulties and rates not being collected because of administrative confusion, the Corporation could not comply. The Company then intimated that they were prepared to proceed with the lighting for the present month only, on condition that the Corporation would arrange to pay the account before the end of the month. At a meeting of the Corporation, Alderman Foley said in all probability they would be able to pay at the end of the month, and Alderman Jinks remarked that the Gas Company had treated them very generously.

By Appointment.
CARRON

Carron Gas Cooking apparatus have been accepted as the standard throughout the catering world, and have been installed in the largest and leading munition factories throughout the kingdom.

¶ The Company's profusely illustrated and descriptive catalogue should be in the hands of all Munition Manufacturers interested. Write for a free copy to-day.

CARRON COMPANY Works: CARRON, STIRLINGSHIRE.

Illustration shows combined Gas Griller, Toaster, and Hot Closet suitable for Cooking for a large number of workers. Strongly constructed, and most suitable for hard continuous use.

Each grilling compartment is heated by four independently-controlled Bunsen burners, and will toast perfectly about 20 rounds under two minutes, the grilling power being in proportion.

Maryborough (Queensland) Gas Company.—It was reported by the Directors at the half-yearly meeting that the profit for the six months ended June 30, after making provision for bad and doubtful debts, repairs and renewals, depreciation, working expenses, wear and tear, and other charges, amounted, including the balance brought forward, to £1156. Out of this, there was recommended the payment of the usual dividend of 6 p.ct. per annum, free of income-tax, leaving £166 to be carried forward.

Working of the Burnley Gas Undertaking.—In connection with the proposed inquiry into the working of the Burnley Corporation Gas Department, the Gas Committee at their last meeting had submitted to them by the Gas Engineer (Mr. J. P. Leather) statements showing a comparison of gas-works' results between Burnley and other towns during 1915 and 1916. The Committee afterwards instructed Mr. Leather to prepare for another meeting of the Committee a report on the working of the Burnley undertaking.

Sydney Municipal Council and Tar Storage.—The Municipal Council of Sydney (N.S.W.) proposed that, with regard to an offer by the Australian Gaslight Company to supply from 100,000 to 300,000 gallons of crude tar, at the rate of 1d. per gallon, additional to the Council's ordinary annual use, a report, dated July 14, 1917, by the City Surveyor thereon, be adopted. The report stated that there was no money available for erecting further storage tanks for tar, and the City Surveyor was not prepared to recommend that the Council should commit themselves to take any specified quantity, as suggested by the Gas Company.

Uttoxeter Council and Street Lighting.—The Uttoxeter Town Council have considered the question of street lighting, and have decided to confer with the Superintendent of Police to ascertain the amount of light he would sanction, and also to obtain from the Gas Company the price for such lighting. It was explained that the Police Superintendent would sanction 14 lamps provided they were shaded, and that the Gas Company were prepared to light these from sunset until 9.30 each night from Oct. 6 to March 31 next, at a cost of £2 10s. per lamp. The Company would undertake to turn-off the lamps in case of air raids. The Company's terms were accepted.

Irish Coal-Gas Motor Enterprise.—The Alliance and Dublin Consumers' Gas Company have taken steps to provide coal gas for the propulsion of motor vehicles, and great interest was shown in the appearance in the streets of a fully-equipped coal-gas driven motor lorry. The Company are now ready to supply gas-containers to suit any type of vehicle; and inquiries are being dealt with daily by the Distribution Department. The Murphy Submarine Pipe Line and Flexible Tube Company, Ltd., have asked the Drogheda Corporation for a lease of the old gaol premises with the object of opening an industry for the production of coal-gas cylinders for motor vehicles.

Lichfield Council and Gas Charges.—The Lichfield City Council have further considered the charges of the Gas Company in respect of the restricted lighting. The Streets and Highways Committee, who had again discussed the matter, reported that they had decided to adhere to their former recommendation that the Gas Company be paid during the period of restricted lighting £218 18s. per annum, less 5 p.ct. discount. The Council discussed the position, and eventually they were not satisfied with the Committee's recommendation. It was then decided that the members of the Finance Committee not interested in the Gas Company should consider the matter, and be empowered to come to terms.

Burton-on-Trent Gas Undertaking.—An increased consumption of gas for the past month is recorded by the Burton-on-Trent Gas Engineer. The quantity sent out for the four weeks ended Sept. 20 was 26,166,000 c.ft.—an increase of 2,088,000 c.ft. compared with the corresponding period of last year. The meter inspectors and collectors have been instructed to inspect the gas-stoves let out on hire, and to impress on the users the necessity for keeping them in good condition and in regular use. In connection with the recent arbitration, on the demand of the Burton gas and other employees numbering 300, for the war bonus of 5s. per week to date from June 18, instead of July 23, the Town Clerk has issued a report in which he states: The point as to the 5s. bonus dating back involved the question of the payment by the Corporation of £475; and the only point which they, according to the terms of reference, expected to be dealt with was decided in their favour. But with regard to the war bonuses, amounting in the aggregate to 7s. per week, these are to be converted into war wages, which means that they will be reckoned as part of the men's wages for overtime purposes. The 5s. bonus granted on July 23 will remain a war bonus, and both the 7s. and 5s. are to be treated as special payments on account of war conditions. The extra cost to the Gas and Electricity Departments for overtime will be £335 per annum.

Dublin Public Lighting.—The Dublin Public Lighting Committee have reported to the Corporation on the employment of extra lamplighters while regular men were on leave. There are 42 men employed in the Tara Street Department, each having, in normal times, an average of 110 lamps to clean, light, and extinguish. The curtailing of the number of lamps lighted in the city areas during the past summer by one-third did not materially reduce the work of the men, as the full route had to be followed in each case. A reduction of the lighting in the "Added Areas" had, however, freed eight men; and, after provision had been made for cleaning, general inspection as to breakages, &c., and the attendance to lamps under railway arches and other places which were kept lighted, five men were available for relief of the regular staff when on holidays. It has been usual since the extension of the holiday system by the Council to take on either five or six temporary men for summer holiday relief work; but this expenditure was saved this year, though it was necessary to take on two extra men for an average of 17 days during the five months, to replace men who were ill. This could only have been avoided by an extension of the holiday system; and, had such an arrangement been carried out, it would not have been possible for the regular staff to have had the lighting of the lamps which had been out of commission resumed by Sept. 1. The Committee assured the Corporation that they had gone carefully into the matter, and that economy had been effected in every possible detail of the working of the Department.

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DEEPFIELDS, Nr. Bilston, Staffs.

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Loss at Dalbeattie.—The Dalbeattie Gas Company had a net loss on the year's working of £154, as compared with a net profit for the previous year of £230. The rise in the cost of coals, increased wages, and changes in the managership were responsible for the deficit.

Coke-Oven Fumes and Land Cultivation.—Regarding bad cultivation of land, the West Riding War Agricultural Committee record an interesting case of a farm at Cadeby which is much damaged by fumes from coke-ovens. On investigation by the Leeds University staff, it was found that while the arable land was in fair condition, the grass land was much deteriorated, and should be heavily limed; while one field should be ploughed out as being too far damaged to recover as grass. The owner and tenant are being informed of the report, and the means suggested of improvement.

Land for Works Extensions at Stafford.—The Stafford Town Council have just completed negotiations with Messrs. Bostock and Co. for the purchase of a piece of land situated near the gas-works, and required for extension purposes. The project had been hanging fire for eighteen months, owing to the Local Government Board having declined to ratify the purchase. Messrs. Bostock had agreed to sell the land for £1125, which was regarded as a reasonable offer, and was accepted. The Council are now again applying to the Local Government Board for their sanction to the purchase.

Blackpool Gas-Works' Profits.—The accounts of the Blackpool Corporation gas undertaking show a gross profit for the year of £23,663, of which £2700 was allocated to the relief of the rates. The net profit was £7699, compared with £11,918 the previous year.

Arbroath Gas-Office Organization.—At the request of the Arbroath Gas Committee, Mr. A. Canning Williams, F.C.I.S. (Treasurer to the Edinburgh and Leith Corporations' Gas Commissioners) recently made an inquiry with a view to suggesting some improvements on the present methods of book-keeping and office organization; and his report and recommendations have been before the Finance Committee, who decided to advise the Town Council to adopt them. Mr. Williams acknowledges the assistance he received from the Gas Engineer and the Chamberlain when making his inquiries. He felt sure from the sentiments to which they gave expression that the Corporation might rely upon their hearty co-operation in any changes that they might make. In looking through the statistics of the gas undertaking since 1902—in which year the Gas Engineer began duty with them—he was greatly struck with the progressive improvements in the manufacturing results, &c. The following comparisons spoke for themselves: Year 1901-2, make of gas per ton of coal, 9100 c.ft.; 1916-17, 11,357 c.ft.; unaccounted-for gas, 9·8 p.ct. in 1901-2 and 3·9 p.ct. in 1916-17; and revenue from residuals, £1077 in 1901-2 and £5934 in 1916-17.

STOCK MARKET REPORT.

The Stock Exchange had a bright time last week; the general tone being excellent from start to finish, though, of course, one or two shaky spots might be found here and there occasioned by special circumstances. The favouring factors were many and various. The almost incessant pounding administered to the foe on the Belgian front, coupled with Germany's internal troubles of a mutinous fleet, a distracted Reichstag, plotting for place and power by would-be Chancellors, a tightening blockade, and the confession of disappointing submarine results, might cheer even the lachrymose pessimist. So markets were firm, without being unduly inflated.

The gift-edged market was conspicuous in the van. Government issues were buoyant, and the 5 p.ct. War Loan touched 95 5/16 and closed at only a fraction less. Consols were in demand. Home Rails were in great form, bettering their advance of the previous week and showing rare activity. American and Canadian were irregular, and Argentines were in poor case for lack of cheering news.

Business in the Gas Market showed an improvement upon the preceding week from pretty well every point of view. The aggregate of transactions showed a good increase, and they were more evenly distributed throughout the list of undertakings. Moreover, outside the list, there was an additional contingent of bargains struck in several of the unquoted undertakings, as noted below. The general tendency was decidedly favourable; Gas Light and Coke, South Metropolitan, Newcastle, and South African scoring advances. The only exception was a further slight fall in Primitiva. The Money Market, after an easy opening, hardened steadily, and rates closed firm.

Bargains done for cash during the week were as follows: On Monday, Cape Town 3¼, Continental Union preference 62, 62½, European 11½, Gas Light ordinary 67½, 67¾, 68, 68¼, 68½, ditto maximum 57½, 58, Imperial Continental 89½, 90, 90¼, Primitiva 42s. 6d. On Tuesday, British 32½, Commercial 4 p.c. 70½, 71, Gas Light ordinary 67¾, 68, 68¼, Imperial Continental 89½, Primitiva preference 58s. 9d., 60s., Sheffield "C" 182, South Metropolitan 73, 73½, ditto debenture 56¼. On Wednesday, British 32½, Cape Town preference 7⅛, Commercial 4 p.ct. 70, 70½, 70¾, 71, Continental Union 40, ditto preference 62, Gas Light ordinary 67¾, 68, 68¼, 68½, 68¾, ditto preference 71, ditto debenture 56, Imperial Continental 89½, 90½, Oriental 105, South Metropolitan 74, South Suburban 75½. On Thursday, Alliance and Dublin 50, 55 5/16, ditto debenture 59, Brighton and Hove original 150, Commercial 4 p.ct. 70, ditto 3½ p.ct. 64, European 10¾, Gas Light ordinary 68, 68¼, 68½, ditto preference 70½, Imperial Continental 89¾, 90, 90⅜, Primitiva 40s., River Plate 63, 63½, South Metropolitan 73½, 74, ditto preference 95¼, 95⅜, ditto debenture 56¼, Bath 82, 82½, ditto debenture 68½, 68¾, Leatherhead 8¼, Rochester 42½, Romford 61, 61¼. On Friday, Alliance and Dublin 55, Brighton and Hove original 148½, 149, Gas Light Ordinary 68¼, 68½, 68⅝, 68¾, 69, 69½, ditto preference 71¼, Oriental 106, South Metropolitan 73⅜, 73⅝, 74¼, ditto debenture 56, 56¼, South Suburban 75, Tottenham "B" 70, Leatherhead 8⅜, Rochester 42.

The Bank rate is 5 p.ct., as fixed on April 5.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Share.	When ex-Dividend.	Prev. Div. or Div. & Bonus. p.c.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref. .	..	57—62	..
1,551,868	,,	April 8	2½	4⅜%	Alliance & Dublin Ord.	59—64	48—53	50—55 5/16
874,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	57—62	59
280,000	5	April 29	7½	3/6	Bombay, Ltd.	5/—6/3	4/—5/3*	..
50,000	10	Feb. 26	16	14%	Bournemouth Gas and Water { 10 p.c.	22—30	23—25	..
888,110	10	,,	7	7%	B 7 p.c.	15—15½	10½—11	..
115,000	10	,,	6	6/-	Pref. 6 p.c.	13½—14	9—9½	..
159,740	—	—	—	4%	4 p.c. Deb.	..	68—71	..
992,045	Stk.	Feb. 26	14	5½%	Brentford A Consolid. .	261—266	79—82	..
734,920	,,	,,	11	4¼%	Do. B New . .	204—209	76—79	..
55,000	,,	,,	5	5%	Do. 5 p.c. Pref. .	109—111	81—86	..
221,400	,,	June 11	4	4%	Do. 4 p.c. Deb. .	91—93	65—67	..
217,380	,,	Feb. 26	11	10%	Brighton & Hove Orig. .	208—213	145—150	148½—150
244,200	,,	,,	8	7%	Do. A Ord. Stk.	154—159	98—103	..
530,000	20	Mar. 26	12½	22/6	British	44—45	32—33	32¼—32½
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk. .	88—90	68—70	..
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	53—56	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	3—3½	3½
100,000	10	—	—	4½%	Do. 4½ p.c. Pref. .	4—6	6½—7½	7½
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	60—65	..
167,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord. . .	108—110	78—79	..
1,513,280	,,	Feb. 12	5/9/4	44/-	Commercial 4 p.c. Stk. .	106—108	70—72	70—71
560,000	,,	,,	5⅓	40/-	Do. 3½ p.c. do. .	103—105	64—66	64
475,000	,,	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	51—53	..
880,000	,,	,,	4	—	Continental Union Ltd.	76—79	39—41	40
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	61—63	62—62½
278,400	—	—	—	11½%	Croydon B and C 7 p.c..	..	165—175	..
—	—	—	—	10%	Do. E	..	..	..
492,270	Stk.	—	6	5½%	Derby Con. Stk. . . .	123—125	95—100	..
55,000	,,	—	4	4%	Do. Deb. Stk. .	102—104	80—83	..
1,002,180	10	July 29	10	5/0	European, Ltd. . . .	17½—18	10½—11½	10¾—11½
16,313,430	Stk.	Feb. 10	4/17/4	37/4	Gas Light and Coke { 4 p.c. Ord. . .	98—102	68—70	67½—69½
2,600,000	,,	,,	3½	3½%	3½ p.c. max. . .	76—79	56—58	57½—58
4,062,235	,,	,,	4	4%	4 p.c. Con. Pref.	96—99	70—72	70½—71¾
4,674,850	,,	June 11	3	3%	3 p.c. Con. Deb.	72½—74½	55—57	56
130,000	,,	,,	10	10%	10 p.c. Bonds .	..	..	..
258,740	,,	Mar. 12	5	3½%	Hastings & St. L. 3½ p.c.	87—89	48—53	..
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16¾	7½—8½	..
26,600	—	—	—	9%	Hornsey 7 p.c.. . . .	..	115—125	..
131,000	Stk.	Mar. 12	7½	7%	Ilford A and C. . . .	151—154	92—97	..
65,780	,,	,,	6⅝	5½%	Do. B	115—118	72—77	..
65,500	,,	June 26	4	4%	Do. 4 p.c. Deb. . . .	92—94	65—68	..
4,940,000	,,	May 14	9	4½%	Imperial Continental .	150—160	89—92	89½—90½
1,235,000	,,	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	65—67	..
236,242	,,	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c. .	119—121	82—87	..
2,498,905	,,	Feb. 26	10	5%	Liverpool 5 p.c. Ord. { A	211—213	81—82	..
					{ B	146—148		
306,088	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	70—72	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4½—4⅝	3¾—4	..
250,000	100	April 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	88—98	..
541,920	20	May 28	4	6/-	Monte Video, Ltd. . .	11½—12	7½—8	..
1,875,892	Stk.	July 29	4½	4½%	Newcastle&Gatsh'dCon.	98½—99½	71½—72½	..
529,705	,,	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—83	61—63	..
55,940	10	Feb. 26	7/14/0	7%	North Middlesex 7 p.c. .	14—15	9½—10½	..
300,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	104—106	105—107
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd. . . .	7½—7⅝	2—3	..
60,000	50	Feb. 26	13	12%	Portsea, Island B . .	128—131	83—88	..
100,000	50	,,	12	11%	Do. C . .	118—121	73—78	..
52,000	50	,,	10	9%	Do. D . .	..	..	..
249,980	5	April 29	8	—	Primitiva Ord. . . .	5½—6	2—2½	40/—42 6
499,960	5	June 26	5	2/6	Do. 5 p.c. Pref. .	4½—5	2⅞—3½	58/9—60/-
521,600	100	June 2	4	4%	Do. 4 p.c. Deb. .	91—93	78—80	..
—	—	—	—	4%	Do. ,, ,, 1911	..	..	..
346,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb. .	85—87	59—64	63—63½
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref..	10½—11	7½—8	..
125,000	50	July 1	5	5%	{ 5 p.c. Deb. .	47—49	40—42	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	223—234	..	..
209,984	,,	,,	10	10%	Do. B	222—224	180—184	182
523,500	,,	,,	10	10%	Do. C	220—222	..	..
90,000	10	May 28	9	6/-	South African. . . .	10½—11½	8¾—9¼*	..
6,609,895	Stk.	Feb. 10	5/4/0	46/8	South Met. 4 p.c. Ord. .	111—113	73—75	73—74½
—	—	—	—	—	Do. Pref. . .	..	—	95¼—95¾
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb. .	72⅛—74½	55—57	56—56¾
224,820	,,	Feb. 26	8¼	7½%	South Shields Con. Stk.	157—159	137—139	..
952,795	,,	,,	6	4½%	S'th Suburb'n Ord. 5 p.c.	114—116	75—77	75—75½
60,000	,,	,,	5	5%	Do. 5 p.c. Pref. . .	110—112	75—77	..
135,000	—	—	—	4½%	Do. West Kent . .	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	86—88	..
647,740	,,	May 14	5	5%	Southampton Ord. . .	99—102	75—77	..
120,000	,,	Feb. 12	7½	5½%	Tottenham { A 5 p.c. .	135—138	92—97	..
782,275	,,	,,	6	4%	District { B 3½ p.c. .	115—117	66—71	70
181,255	,,	June 26	4	4%	{ 4 p.c. Deb.	87—89	63—65	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max..	108½—109½	89—91	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Feb. 26	8⅜	72/6	Wandsworth A 5 p.c..	151—156	112—117	..
255,636	,,	,,	6¼	57/6	Do. B 3½ p.c. .	129—134	97—99	..
108,075	,,	,,	5/17/3	50/9	Do. C 3½ p.c. .	110—115	84—89	..
352,000	,,	,,	6⅛	51/3	Wimbledon 5 p.c. . .	117—122	85—90	..
98,000	,,	,,	6⅔	57/6	Epsom 5 p.c. . . .	121—126	93—98	..
88,416	,,	June 26	3	3%	3 p.c. Deb. Stk. . .	66—69	50—53	..

* Ex Div.

Gas-Cylinders for Household Use.—It has been suggested in a Belfast paper that cylinders should be provided by the Corporation gas undertaking into which gas could be pumped in a compressed state, and so delivered to outlying districts where a regular supply has not been laid down. The idea is, of course, that this compressed gas would be of great service to householders now compelled to light and cook by oil.

Advance in Price at Brighouse.—The Brighouse Corporation Gas Committee are reminding consumers, by public notice, of an intimation issued fourteen months ago, warning them of a possible advance in the price of gas, subject to any rise in the price of coal. This advance was not required up to Sept. 30; but the Committee now notify the public that gas charges are subject to an advance as from Oct. 1 (to be kept as low as coal charges will permit), on account of the increase in prices to meet the higher wages of miners.

Free Gas to Belgian Refugees at Gainsborough.—The Gainsborough branch of the Amalgamated Society of Engineers have sent the following resolution to the Gainsborough Gas Committee, protesting against their action in writing-off the gas accounts of Belgian refugees resident in Gainsborough: "That the members of the Gainsborough Branch of the Amalgamated Society of Engineers strongly protests against the free provision of gas to local Belgians unless their circumstances warrant it, and further claim that, in similar circumstances, the same privilege be extended to our own countrymen."

Manchester and District Junior Gas Association.—The first fixture for the 1917-18 session of the Association was a visit on Sept. 1 to the works of the Staveley Coal and Iron Company. On Nov. 3 there will be a visit to the Whitworth Street, Manchester, furnace show-rooms, and papers by Mr. E. W. Wilson, on "Care and Maintenance of De Brouwer Stoking Machinery," and Mr. J. H. Clegg, entitled "Some Observations on Benzol Extraction at Gas-Works." The Ormskirk Gas-Works will be visited on Feb. 2, 1918, when papers will be read by Mr. W. Fletcher and Mr. J. W. Thornley. April 6 will be the date of the general meeting.

An Arbroath Corporation Gas Annuity of £3 10s. was recently offered by public roup at the upset price of £60, and was purchased for £62 5s.

An increase in the rate for gas is notified by the Sanquhar Town Council. For ordinary meters the advance is from 5s. 10d. to 6s. 8d. per 1000 c.ft., and for prepayment meters from 6s. 3d. to 6s. 10d. More street lights are to be lit this winter.

The Ilkley District Council have decided on a general increase of officials' salaries. In the Gas Department are those of the Gas Manager, increased from £325 to £350; the gas collector, from £134 to £150; and the department book-keeper, from £104 to £117.

Producer Gas Plants has been registered with a capital of £25,000, in £1 shares, to acquire and develop certain patents relating to the production of gaseous fuel by portable apparatus, and for the manufacture of machinery for the propulsion of automatic vehicles by such fuel, &c. The offices are at No. 5, Albany Courtyard, Piccadilly, W.

To meet the increasing demand for gas for motor vehicles in the city, the Leeds Gas Department have equipped filling stations at the gas stove and meter department at Sovereign Street, the New Wortley works in Wellington Road, and the gasholder station in Viaduct Road, off Kirkstall Road. A charge of 4d. per 100 c.ft. is being made.

At the Doncaster County Court last week, the Conisboro' Gas Company, Ltd., were awarded £47 in a claim which they brought against Ernest V. Braithwaite, a haulage contractor, for damage to a weighbridge, on which he had stood a heavy traction engine, in spite of warning, while removing wagons of spent oxide from the Company's works.

The Walsall Corporation Gas Committee have fixed the general price of gas for traction purposes as follows: On any week day between 8 a.m. and 6 p.m., except Saturday, when the hours be 8 a.m. to 1 p.m., 4d. per 100 c.ft. (being at the rate of 3s. 4d. per 1000 c.ft.). On Sunday, or on any week-day after the above-mentioned hours, 6d. per 100 c.ft. (being at the rate of 5s. per 1000 c.ft.). The Engineer has been authorized to fix the necessary meters at the Pleck and Wolverhampton Street Gas-Works.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

ENGINEER AND MANAGER. Portrush Gas Company. Applications by Oct. 17.
DRAUGHTSMAN. No. 6367.
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LEADING STOKER. No. 6368.
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Special care has been taken to make the carbonization portion as full and complete as possible. Indeed, in almost every department additional useful matter has been introduced.

It is hoped that these efforts to bring the work up to date will be appreciated by readers, and help to maintain the high reputation of the book as a work of reference.

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